American Journal of Obstetrics and Gynecology

VOL. XXV ST. LOUIS, FEBRUARY, 1933 NO. 2

Original Communications

THE QUALIFICATIONS OF THE SPECIALIST*

PRESIDENT'S ADDRESS

WALTER T. DANNREUTHER, M.D., NEW YORK, N. Y.

A POLITICAL philosopher once made the epigrammatic comment that some men think that they have been called when they have not even been whispered to. One year ago, I was called to serve as your President without having been whispered to beforehand, and although anxious to avoid any bromidic remarks, I cannot refrain from expressing my gratitude to you for conferring upon me the greatest honor within your gift, and for affording me the opportunity to serve the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons in a capacity I had never anticipated.

Since the preliminary plans which culminated in the creation of the American Board of Obstetrics and Gynecology were proposed and formulated within this Association, and the parent bodies are responsible not only for having endorsed and supported the project since its inception, but also in part for its proper functioning, it seemed that at this time I might with propriety discuss some of the details involved in the operation of the new organization you have fostered.

During recent years the medical profession has been afflicted with numberless irresponsible self-styled specialists. Their rapid multiplication has been due to several factors, not the least of which is that the public began asking who is a specialist before it thought to inquire what a specialist is. In view of the fact that the emoluments of an expert in one of the special fields of medicine are greater than those of a general practitioner,

*Read at the Forty-Fifth Annual Meeting of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, French Lick Springs, Indiana, September 12, 13, and 14, 1932.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

that a license to practice imposes no restrictions upon its holder, that the reprehensible secret division of fees will insure a satisfactory financial return in many communities, and that the laity has had no criteria whereby it could distinguish those specialists who are well qualified from those who are not, it is not surprising that certain men without the necessary background of intensive training and wide experience have been tempted to misrepresent themselves. Asepsis, the skillful administration of anesthetics, and modern operating room technic have eliminated the hazards of pelvic and obstetric surgery to such an extent that the lure of the operating amphitheater is hard to resist. The pernicious tendency to teach senior medical students and hospital internes the refinements of major procedures at the expense of fundamentals is largely responsible for much of the unjustifiable and premature specialization. Entirely too many of the recent graduates gain the impression that gynecology and pelvic surgery are synonymous, and that the practice of obstetrics consists of either a professional reception of the baby, the application of forceps, or the performance of a cesarean section. They have not the proper conception of the art of adapting therapy to pelvic symptomatology, the importance of mature and correct obstetric judgment, the effects of particular operations upon the childbearing function, and the numerous factors that subsequently influence the patient's psychologic stability and domestic happiness. As W. T. Smith said as long ago as 1858, "they have no methodized habits, no illustrative reminiscences to throw light upon the obscurities which may occur in their subsequent practice." They do not seem to realize that academic knowledge and the science of the laboratory can never entirely replace the wisdom of clinical experience. Imbued with such erroneous ideas, and with none to say them nay, they become specialists in obstetrics and gynecology by pronouncement. There are only two logical ways in which this state of affairs can be remedied: first by legislation, which is impracticable in this country, and secondly by the refusal of the profession and laity to tolerate the existence of pseudospecialists.

The term "specialist" implies that the individual so designated has had superior training and has assimilated knowledge from a multitude of opportunities, and the public is just beginning to display an interest in the qualifications he really possesses and to question his authority for so classifying himself. A specialist differs from a general practitioner in education, not in intelligence. As a matter of fact, the modern well trained doctor is essentially a specialist in internal medicine, pediatrics, minor surgery, and normal obstetrics. A hospital interneship is requisite to practice medicine in but fourteen states, and only six specifically refer to the applicant's attendance upon confinement cases. Uniform standards for licensure must of necessity be secured by the enactment of legislative modifications in the medical practice acts of the different states. These are extremely difficult to accomplish and susceptible to political expediency. With such inconsistencies in the various laws pertaining to the practice of

medicine in general, the suggestion that specialism can be regulated by legislation is nothing more than a Utopian hope. But it is not unreasonable to expect that if the specialists themselves, with the sanction of the profession at large, certify to the proficiency of those who are competent, the public, both lay and medical, will be provided with a means for proper discrimination, and the State will be enabled to endorse such certification without alteration in its medical practice act.

The justification for the establishment of standards of qualification by the medical profession itself, to fix the requirements for legitimate specialization, thus appears to be self-evident, and it was with this objective in view that the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, the American Gynecological Society, and the Section of Obstetrics, Gynecology, and Abdominal Surgery of the American Medical Association assumed the obligation of creating the American Board of Obstetrics and Gynecology. By virtue of the harmonious participation and coordinated action of these three preeminent groups of obstetricians and gynecologists, the Board was endowed with an unassailable prestige. Its establishment was preceded by three years of preliminary study and careful planning on the part of the three committees charged with the task of evolving a satisfactory method of certification. The work was carried on so unobtrusively during the formative period of the committeemen's deliberations, that at the time of the Board's incorporation in September, 1930, a great many obstetricians and gynecologists were unaware of the manner in which it had been organized and its idealistic purposes. Not fully appreciating that each of the three National societies had elected three Fellows to comprise the membership of the Board, in some quarters its motives were viewed with suspicion, and its personnel mistaken for a self-appointed autocratic group who presumed to dictate to their colleagues. Voluminous correspondence, perseverance, and courteous explanations have been necessary to correct all sorts of misconceptions, a few of which still prevail. The activities of the Board have received the commendation and support of practically all of the distinguished obstetricians and gynecologists throughout the country, and the roster of its certificate holders now includes 369 names. Of these, 115 have been certified after examination. In June, 1931, the Board was notified "that the American College of Surgeons shall recognize the certificate of the American Board of Obstetrics and Gynecology as an evidence of the academic fitness in these specialties of candidates for its Fellowship who hold such certificates." Such sporadic instances of adverse criticism and hostility as yet exist are due chiefly to the rejection by the Board of all applications from those who do not limit their practice to obstetrics and gynecology, and to its refusal to certify without examination candidates who have no more than a local reputation, solely on the recommendation of their associates or friends. Many eligible obstetricians and gynecologists have apparently hesitated to apply for certification because of a not

unnatural anticipation of embarrassment during the course of examination. The most trying duty the members of the Board have had to perform has been to resist the importunities of those who are probably well qualified, but whose competency for special practice is unknown outside of their respective communities. It should be obvious that personal endorsements as testimony of fitness might soon lead to dangerous injustice and a lowering of standards. The slightest exercise of favoritism, influence, and even prejudice would jeopardize the value of every certificate issued. All applications have been referred to a Committee on Credentials which is charged with the responsibility of classifying candidates. Each diplomate of the Board who was certified without examination received the unanimous vote of all nine examiners, and subscribed to a statement that he restricted his practice to obstetrics or gynecology; and with comparatively few exceptions, each one was either a Fellow of this Association or the American Gynecological Society or held a professorial rank in one of the medical schools. Certification without examination was discontinued on December 31, 1931.

The Board has arranged that no examiner shall participate in the survey of any applicant from his own territorial district nor of one with whom he is personally acquainted. This provision precludes violation of the candidate's professional pride and an insinuation that his attainments are in any way disrespected. The object of conducting an examination is to discover the extent of the applicant's knowledge, the character of his practices, and his cultural and scientific attributes. Personal evaluation must always supplement standardized requirements.

The chief purposes of the Board are not restrictive, but educational: to encourage and induce potential specialists in obstetrics and gynecology to prepare themselves thoroughly, to persuade medical schools and hospitals to provide adequate facilities for special training, and to put the stamp of approval on qualified specialists. There is no inclination to curtail the professional responsibilities that any licensed physician may care to assume, nor an implication that a distinguished or well qualified specialist requires a further testimonial of his capabilities. Neither has the Board the desire nor power to control or govern the practice of obstetrics and gynecology, and applications for certification must always be voluntary.

Thirty years ago the novitiates in medicine had the benefit of the wise counsel and supervision of their preceptors, a custom which might well be revived. The highest professional ideals, a broad humanity, intellectual honesty, and an incorruptible conscience were inculcated in the younger men by their seniors. There were but meager institutional opportunities for the training of specialists, and that a young man should presume to pose as a specialist until he had carried on a general practice for at least five to ten years, studied incessantly, and served a prolonged apprenticeship to a recognized authority was unthinkable. That conditions have changed materially is well exemplified by the recent statement that it is

now relatively easier to be a specialist than it is to be an up-to-date, well trained general practitioner. Few modern neophytes study actively the various branches of medicine after graduation, or seem to be concerned with the importance of a firm foundation in general medicine as a basis for specialistic ambitions. In a timely address on "Specialism" in 1892, Osler said, "no more dangerous members of our profession exist than those born into it, so to speak, as specialists." That aphorism is as pertinent today as it was forty years ago. It is not at all unusual at the present time to witness the ex-house officer within six months after completion of his interneship alternating with his former attending surgeons in the operating rooms. He appears seriously interested in curettage, appendectomy, and hysterectomy, but he has yet to learn that the curette will not cure leucorrhea, that pain in the right lower quadrant is usually due to something other than the appendix, and that while removing the uterus may be the easiest it is not always the best way to arrest uterine bleeding. The members of the American Board of Obstetrics and Gynecology believe that while the young man under proper guidance may practice obstetrics and gynecology safely, he is not entitled to announce himself as a specialist until the lapse of at least five years after his interneship, and the devotion of three of the five years to intensive training in obstetrics and gynecology. This special training need not necessarily be full time institutional work, but it must otherwise embrace a satisfactory apprenticeship or postgraduate education, with concurrent clinical experience under supervision. The candidate must demonstrate his proficiency in the diagnosis and nonoperative treatment of pelvic disorders, and exhibit good obstetric and surgical judgment.

It is almost incredible that with the available laboratory facilities, clinical pathology should be ignored by those who have the greatest opportunity to profit by it and correlate it with their daily work. In this respect the examinations already held by the Board have revealed an astonishing indifference to a knowledge of the pathology of common obstetric abnormalities and pelvic diseases and neoplasms. It does not seem unduly exacting to expect one who professes to be expert in operative procedures to be familiar with the intrinsic pathologic alterations in the tissues involved, but it has been apparent that comparatively few obstetricians and gynecologists have sufficient scientific interest to follow their specimens to the laboratory. Ample evidence is at hand, however, to indicate that many of the younger men have been stimulated to read and study so that they might be prepared to pass the examination for certification. And those who have failed once in the examinations already held have endeavored to correct their deficiencies or have indicated their intention of augmenting their qualifications before presenting themselves for reexamination. These immediate effects of the work of the Board have been very gratifying.

Letters of inquiry have been addressed to the Board repeatedly, asking

where the writers might secure the advanced work requisite for specialization, but in most cases it has been impossible to direct the applicant with an assurance of the fulfillment of his aspirations. The comprehensive report emanating from the Medical Service Subcommittee on the Graduate Education of Physicians for the White House Conference on Child Health and Protection, in 1930, was based on an accurate and inclusive inventory. It disclosed that although the institutional facilities for the development of specialists in obstetrics and gynecology have been amplified materially since the beginning of the century, they are still inadequate in both number and scope. Complete unification of obstetrics and gynecology has not been accomplished in the majority of medical schools and hospitals. In fact, in a number of the latter it is distressing to note that gynecology has not been divorced from the department of general surgery. The departmental integration and fusion of obstetrics and gynecology is not only desirable but highly essential, because the skillful practice of one is dependent upon a thorough knowledge of the other. Skill comes not only from a maximum of cases, but also from the absorption of information derived from sound precept and observation. It must be conceded that the large *Frauenkliniken* abroad are far better equipped to produce specialists than our own institutions, although the available clinical material is no greater. The White House Conference Committee report stated that "there is a total of 1045 obstetric-gynecologic teachers in our medical schools. We may conclude that nearly 1000 of them have been self-trained." The following additional excerpts from the Committee's conclusions are significant:

"The obstetrician who does not do the surgery of the lower abdomen is hardly competent to do the major abdominal work of obstetrics.

"The gynecologist who is not in intimate contact with all phases of obstetrics has lost much of his perspective in operating on women of the childbearing period.

"There were 1045 teachers of obstetrics and gynecology in the United States last year (1930). The vast majority of these developed themselves after a more or less insufficient under-graduate training.

"Nine graduate schools turned out about 100 trained men: these men worked for years as subordinates, supervised, and then as their competency was recognized they were given full recognition as clinicians.

"The great majority of men posing as obstetric specialists have had very little training: their experience has been gained by practice—and practice does not always make perfect.

"One large city carries in its medical directory the names of 411 obstetric and 440 gynecologic specialists. The term 'specialist' is well nigh meaningless in this country. A new order of being demands that no man may pose as a specialist until he has proven his ability to so function."

The Board has appointed a Committee on Graduate Education, which will undertake to devise ways and means to rectify some of these defects in our educational system.

The public has a right to expect the medical profession to safeguard it from the malpractices of mushroom specialists, and five of the specialistic

groups, of which we are one, have manifested their disposition to accept their share of responsibility, by creating examining boards under the auspices of the National societies. The endeavors of these Boards are not offered as a corrective panacea for all the defects of professional practice, but they can at least wield a salutary influence, especially if they receive the active cooperation of their diplomates. The establishment of desirable standards for specialists minus an impartial and widespread application of them would be merely intellectual exercise. The certificates of the American Board of Obstetrics and Gynecology can be a protection to local obstetric and gynecologic societies as well as to hospitals. Several of the ophthalmic and otolaryngologic medical societies have made the possession of either of these certificates essential for membership, and it would be to the advantage of the obstetric and gynecologic organizations to emulate their example. One sectional society has already adopted the Board's standards of qualification as a prerequisite for eligibility.

Whereas in the beginning the motives of the American Board of Obstetrics and Gynecology were regarded with considerable skepticism by many of our professional brethren, during the past two years the project has gained tremendous momentum, and its successful functioning has now attracted the attention of other educational groups. A willingness to exercise a paternalistic supervision over the activities of the Board has already been intimated. In my opinion, nothing can be gained by permitting it to become subservient to extraneous influences, whatever their purposes may be. It is not inconceivable that informal contact might develop into domination, and finally eventuate in absolute control. The authority and powers of the American Board of Obstetrics and Gynecology are derived from the parent National societies, and it is to these, and only to these, that the Board should be answerable.

It is a tremendous responsibility for anyone even to insinuate that the technical practices of another are wrong. The examiners have done the best they could at all times, regardless of censure or applause. Nothing but the merit of its objectives and its successful accomplishments can perpetuate and insure the future existence of the American Board of Obstetrics and Gynecology, and in these I have full confidence.

580 Park Avenue.

SOME PHASES OF THE TOXEMIAS OF PREGNANCY*†

BETHEL SOLOMONS, M.D., F.R.C.P.I., F.C.O.G., DUBLIN

(Master of the Rotunda Hospital)

THE Rotunda Hospital of Dublin has existed for nearly two hundred years. Its bicentenary will be in 1945 and during this period every effort has been made to keep up to date, to try out the new without forgetting the old, to remember above all, that obstetrics is a difficult subject, that it is a science and an art, and not a trade, and that every effort must be made, not only to preserve the life of the mother and the child, but to discharge the mother from hospital healthy and happy without being marked for life with the traumatism of labor.

In addition, as is well known, students, postgraduates and nurses from all parts of the world are trained at the Rotunda. This system has great advantages: in their future professional life they will work together and it is well they should be brought up together. The segregation of nurses and doctors in maternity training has never appealed to me and I hope that the custom which has been so long in vogue in Dublin will long continue. The presence of these three bodies of pupils should make the teacher meticulous in his technic. He must never indulge in any small departure from detail for there are no more severe critics of any digression than the average student, postgraduate, or midwife and there is none more ready to adopt such digression as a practice. In other words, the child in obstetrics must be taught good manners as the child in life is taught in the nursery and example is the best method of teaching.

The causes of the toxemias of pregnancy are unknown: the number suggested and proved to be causal factors emphasizes this fact. I cannot give a full consideration to this discussion within the limits of this communication: most of the theories will be mentioned in order to be discarded and the only two which can "hold water" at all will be discussed. These two theories must be taken together: they are the only two which can be proved by clinical results to a large extent and by laboratory results to some extent. They are the theories of Young and that suggested by Tweedy and held and elaborated at the Rotunda Hospital. We have been quoted in the past as stating that "the cause of eclampsia is in the gut," and that "food causes eclampsia." Both these bald facts are incorrect and I desire to refer to the book on *Practical Obstetrics,* which now bears my name.[3] "We know full well that food is one of the

*The Joseph Price Foundation Lecture, presented by invitation, before The American Association of Obstetricians, Gynecologists and Abdominal Surgeons, at French Lick Springs, Indiana, September 12, 1932.

†For lack of space this paper is published in an abbreviated form, but the complete article will appear in the author's reprints as well as in the current volume of the Association's Transactions.

common factors, but we are in entire agreement with Young and others who state that the disease is of toxic origin, that this toxin is almost certainly derived from the placenta, either from the chorionic villi or from placental infarcts or from the blood. The fact remains that the exact toxin has never been found, but it probably circulates in the blood of the patient. The destructive changes found throughout the body are due to the action of this toxin. This does not explain the whole cause as it does not explain why toxemia occurs in some patients and not in others. Food is the cause, but not directly as will be shown later. It is well known that all foreign proteins must be changed by the ferments of the body before they can be assimilated: if they are absorbed without undergoing such change they act as irritant poisons. The poison of eclampsia, for example, may be explained in this way, on entering the body this toxalbumin must be neutralized by the ferments already present if its destructive effect is to be avoided. Is it not reasonable to conclude that the ferments which effect this neutralization are those which fix the amino-acids derived from food?''

* * * * *

Our view may be summed up by the following simple table:

Food poisons plus toxins of pregnancy	Excess of food poisons. Amino-acids plus toxins of pregnancy
Enough ferment for both	Insufficient ferment for both, i. e. ferment used up for pregnancy toxins
No toxemia	Insufficient neutralization
	Toxemia

* * * * *

Of all the tests in diagnosis of toxemia, there is none more simple than the Fouchet test. It is easily done and the results can be reported very shortly; it is also reliable in the diagnosis of liver involvement. In a former communication[4] Bourke and the writer showed it to be most valuable in hyperemesis gravidarum without albuminuria, but that in eclampsia and eclampsism, it was chiefly negative. That is, of course, the expected result.

We cannot agree with Cruickshank[5] et al., who state that the results of tests of hepatic function are of no real service. Enough has been said to show our feelings about the intestinal indirect origin. Suggestions have been made that intestinal hyperpermeability leading to absorption of toxic intermediate products of digestion, e. g. peptones, or bacterial metabolism may be the definite cause. Acidosis due to double metabolism is a simple thing to claim but brings us no further and those who speak of alimentary autointoxication may reiterate, in a different way, our own sentiments.

A theory to support our view is that of Alvarez[6] who, in his impartial review, summarizes the evidence for toxemia of autogenous origin and dis-

cusses the importance of the alimentary tract. He, however, concludes that the mechanical factor is specially important in causing vascular engorgement of the intestinal wall, stasis and abnormal permeability.

As the mechanical factor has been mentioned, Paramore[7] must be quoted. Intraabdominal pressure is his catchword and this, he says, is fundamentally related to general metabolism. The greater the intraabdominal pressure, the greater the return of blood to the heart. Paramore's conception that eclampsia is simply a manifestation of a gradually perverted metabolism due to an excessive compression preventing visceral activity, is supported by the fact that the levator ani muscles hypertrophy in pregnancy, that eclampsia occurs in the strongest women with good abdominal walls. Can it be believed, says Paramore, that any specific toxin is in play? We fear that he has unwittingly evaded the issue.

Then Theobald[8] shows by experiments that albuminuria associated with pregnancy can be accounted for by mechanical means, e. g., lordosis, diminished thoracic capacity of later months of pregnancy, and the weight of the uterus. Possibly the damage to the kidney in eclampsia is the same as that caused by increasing the pressure in the renal vein.

My late assistant, O'Donel Browne,[9] following the example of my chief, Tweedy, tries to show the relation between blood extravasation and albumin and applies this to theorize on accidental hemorrhage. It is an interesting theory, but there are too many albuminurias without extravasation of blood, and too many cases of blood extravasation without albuminuria, to permit its acceptance. It may, however, lead to something.

Titus[10] has stated that "there is a disturbance in carbohydrate metabolism, but hyperglycemia is not characteristic of eclampsia. As convulsions in eclampsia are to be designated as a hypoglycemic reaction or manifestation, insulin with or without glucose is unnecessary and contraindicated. Intravenous injection of hypertonic glucose solution has a definite basis for its proved therapeutic value." I have the greatest respect for Titus, but this does not explain the whole case for treatment of the toxemias, nor is it, I am sure, intended to do so.

James Young,[11] who reiterates the statement that there is some factor in eclampsia which causes placental damage must be listened to. He proves his point to a large extent, and his theory, taken in conjunction with ours, bears close investigation. It is only necessary to read the works of Cruickshank and Stander[12] to realize how difficult it is to theorize on this subject. In summing up the question of theories, Cruickshank concludes that if the toxemias of pregnancy have a common cause, it is some form of intoxication from the breakdown of placental tissue, probably some of the higher forms of protein catabolism which, like the breakdown products of lecithin, have a powerful action even when present in a small amount.

The theories of etiology of eclampsia as collected by Stander are:

autointoxication, fetal elements, fetal metabolic products, placenta, infection theory, endocrines, biological reaction, mammary, diet, renal origin, edema theory, capillary spasm, oxygen deficiency, nervous origin, liver, nitrogenous retention, inorganic constituents of the blood, lipoids, colloids, carbohydrates, acidosis, and hypertension.

A close study of this extended list has unfortunately compelled us to refuse acceptance of any one of them. If theories are to be of any real value they must assist in determining suitable clinical treatment. When followed out to the bitter end, it has been found that there has been no useful treatment derived from any of these. Our own treatment has a direct relation to our theory of the cause.

VARIETIES OF TOXEMIAS

The nomenclature regarding toxemia of pregnancy seemed on investigation to be so inconclusive that a questionnaire was sent to various institutions and the answers obtained from them will be summed up later. To the Registrars of the Institutions and the Chiefs of the Clinics my thanks are tendered for their kindness in replying. Unanimity was observed about certain diseases. All included eclampsia, eclampsism, hyperemesis and acute yellow atrophy. Two omitted accidental hemorrhage altogether. Essen Möller modified the kidney cases by including albuminuria, with not more than 10 per cent albumin and nephritis, with more than 10 per cent albumin. Herpes, salivation, chorea, and melancholia were included in the lists of some of the others. This list could be added to enormously but from a practical point of view an increase clouds the issue and leads to no beneficial result. It is noteworthy that accidental hemorrhage is not included in the works of Stander or of Cruickshank and his colleagues.

I desire to discuss briefly: Albuminuria without marked toxemic signs and symptoms, eclampsism, eclampsia, hyperemesis gravidarum, and accidental hemorrhage.

* * * * *

ALBUMINURIA, ECLAMPSISM, ECLAMPSIA

Such is the simple classification I use of the toxemias whose chief and cardinal system is albuminuria, because it is simple, it expresses a definite thing, and other classifications in my opinion confuse the issue, instead of clarifying it.*

* * * * *

Albuminuria.—This refers to a condition in which the patient is admitted to the labor ward, simply because of albumin in the urine. She is supremely important because if she is not carefully watched she may develop eclampsism, eclampsia, or some other type of toxemia. In this

*Since writing this Young (J. Obst. Gynec. Brit. Emp., **39**: 2, 310) has suggested "Preeclampsia and Eclampsia" as the best classification and this practically coincides with ours.

type there are no other symptoms, the blood pressure is often not raised, the output of urine is not decreased, there is no marked edema. The blood urea is normal and other biochemical tests are usually negative. In spite of all this, the patient must be carefully treated and again, simplicity is the keynote. We classify albuminuria as follows: trace, present, abundant, or solid. The first warns us of danger, the second that danger is present, "abundant" suggests eclampsism, and solid that eclampsia is nearly always present.

I have tried all laboratory tests with a view to determining treatment, but reliance is placed almost entirely on the clinical manifestation. Water is given to the amount of four or five pints daily, flavored with lemon juice, also glucose. Glucose is given by the bowel. Purgatives are given at least once daily and enemas, if necessary. If the condition has not cleared up in three days induction is done. We used to leave these patients four days but a condition of hypoglycemia may arise if starvation is continued too long.

Eclampsism.—It is questionable whether a term which suggests "similar to eclampsia" is better than a term which suggests "before eclampsia." We prefer the former. Eclampsism is eclampsia without fits. All the symptoms and signs of the latter are present and the postmortem findings are the same. We treat our cases in the same way as we treat eclampsia except that morphine is not administered unless the patient is very restless, also induction by means of puncture of the membranes is done after three days' treatment without improvement. It must be stressed that it is far better to pursue treatment before induction rather than induce at the peak of the illness. It is well known that the kidney condition does not improve in labor, so that a diminution in the amount of albumin, a lowering of the blood pressure, and an increase in the amount of urinary secretion are all desirable before induction.

If the amount of albumin is great, if the secretion of the urine is small, if the blood pressure is between 180 and 200 systolic, while the blood urea is 100 mg. per cent, induction will surely be necessary. If the symptoms of eclampsism occur in the early months the case is nearly always prepregnancy nephritis. Termination of the pregnancy is nearly always indicated in this class of case and a vaginal or abdominal section is usually the treatment in the presence of a chronic nephritis.

Eclampsia.—In a recent communication[15] the writer, with Bourke, stressed particularly the nomenclature of eclampsia. Questions submitted to various maternity hospitals elicited the fact that "fits were necessary in nomenclature." In this paper several cases were described showing difficulty. One was a para iii who had had two normal confinements. She was admitted in convulsions and with blood pressure 122/70. She had routine treatment and was delivered spontaneously of a stillborn fetus weighing 4¾ pounds. There were signs of consciousness returning and she seemed to be improving. Later coma returned. Blood pressure 142/70. Blood urea 30 mg. per cent. She then proceeded to have 31

convulsions and died. The postmortem report was atypical for eclampsia and exemplifies not only the danger of fits in the multipara but also the difficulty of determining whether a patient has eclampsia or not.

We then proceeded to give the postmortem results side by side with those found in typical eclampsia. The case quoted was not an eclamptic. She had, however, fits and toxemia, therefore she must be included in eclampsia statistics. We define eclampsia as the occurrence of fits in a pregnant or puerperal woman which would not have occurred if she had not been pregnant.

Williams does not go so far and defines eclampsia as an acute toxemia occurring in the pregnant, parturient or puerperal woman, usually accompanied by clonic and tonic convulsions. He states that while the convulsions are by far the most startling clinical manifestations of eclampsia and give the disease its name, instances are occasionally met with in which they are absent. Greenhill,[16] in 1926, in his definition mentions convulsions, but includes also those cases of acute toxemia without convulsions, which at necropsy show the changes characteristic of eclampsia. Greenhill's definition bears out the difference in opinion on this subject. A perusal of his 78 cases, however, shows that convulsions *were* present in all.

We cannot find a definition of eclampsia in the monograph by Stroganoff.[17] We fear, until it is otherwise ordained at an International Congress, that we must include in our statistics of eclampsia (until it is proved otherwise) these pregnant or puerperal women who die having had fits, unless the postmortem results reveal absolutely atypical lesions. If the patient does not die, she too, for the present, must be included, and if she does and a necropsy is impossible, then she also is grouped as eclampsia.

Notes of questionable cases could be multiplied many times.

Since writing this, Stander,[16] Ashton and Cadden[18] state that in one-tenth of their cases diagnosis is difficult. They recommend urea and creatinine excretion tests for routine use in all cases of toxemia of pregnancy where the diagnosis is not clear. A urea clearance of below 80 per cent of the normal and a creatinine excretion below 155 mg. in the first hour, are strongly indicative of renal damage. Does the word "indicative" mean certain?

Eclampsia may occur from the sixth lunar month until forty-eight hours after delivery although cases have been reported some days after this. It is a grave disease at any time. It is most serious in the puerperium of the multiparous patient. In our last investigation of 204 deaths, the death rate was 8 per cent. In the first five years of the present Mastership the death rate was 12.9 per cent. If the true eclampsism cases are taken with these the mortality rate becomes 6 per cent.

Symptoms and Signs.—In a communication of this kind these will not be dealt with minutely. The warning signs and symptoms must be treated. These are headache, vertigo, partial or total blindness, pruritus,

drowsiness, mental irritability, insomnia, edema, diminished secretion of urine, raised blood pressure. A very itchy nose often precedes a fit.

As eye symptoms have been mentioned, it will be of interest to refer to a small investigation of the eye symptoms made at my instigation at the Rotunda by our consulting ophthalmologist, Mr. F. Crawley and his assistant, Dr. L. Werner. In this investigation 250 cases were examined of which 186 were normal, and 64 were in toxemic women. Of the former 186 the eyes were normal in 179 and abnormal in 7.

* * * * *

Does it seem as if the retinitis-producing toxin is of bad obstetric import, and have the cases with retinitis done worse than these with albumin, but retinitis free?

The only other sign which must be mentioned is elevated blood pressure. This is considered to be a most valuable sign by F. J. Browne.[19] There is no doubt that the recognition and treatment of warning symptoms and signs followed by appropriate treatment will allow us to ward off an attack. It is not proposed to describe the eclamptic fit nor to delve into differential diagnosis. The treatment will be considered in detail and it must be remembered that every detail must be attended to, and that eclampsism is treated in the same way as eclampsia, except in so far as the fit is concerned.

TREATMENT OF ECLAMPSIA AS CARRIED OUT AT THE ROTUNDA HOSPITAL

The treatment at the Rotunda has stood the test of time and seems theoretically and practically sound. It is not intended to discuss other treatments in detail but some must be mentioned: cesarean section, abdominal or vaginal. This treatment is the favorite of the gynecologist who is practicing midwifery in contradistinction to the obstetrician who is practicing the science and art of obstetrics, and this question is truly very important if maternal mortality is to be lowered. Some gynecologists seem rather to revel in the fact that they only do consulting midwifery: these men cannot know the subject. At some Utopian time there will be a law that only practicing obstetricians may be called into consultation on obstetric problems, then cesarean section at sight for nearly every complication will be a thing of the past.

The results of the discussion at the British Obstetrical Congress in 1923 showed clearly that palliative measures were best, and since that meeting, nonradical measures have been popular in Great Britain and Ireland. Certainly cesarean section in Ireland met with disaster in the treatment of eclampsia. In Greenhill's interesting paper he says that the treatment should not be entirely conservative nor entirely radical, but favors emptying of the uterus in experienced hands. In spite of this a study of his mortality figures shows spontaneous deliveries with 3.4 per cent deaths, cesarean section 6.7 per cent, forceps 9.5 per cent, version and extraction 14.3 per cent.

Apart from radical measures, drugs to bring down the blood pressure were popular for a time: this is an incorrect line of treatment for a gradual fall in the blood pressure is valuable, a sudden fall sometimes means fatality.

Other treatments such as kidney decapsulation, magnesium sulphate, etc., are only small points included in large technics. Once we belong to what may be called the palliative school, we must be Rotunda or Stroganoff and in spite of figures the treatment carried out in Dublin seems more rational. Great respect must be accorded to Stroganoff for his work, but it is difficult, bearing in mind the work done by Bollman[20] on the effect of chloroform on the liver, work showing that chloroform had exactly the same effect on the liver as the toxemias, to accustom oneself to give chloroform to the eclamptic with the very depressed heart! No more will be said, but at the risk of repetition our treatment will be given in full detail.

The only changes I have made are the administration of glucose either by the mouth or bowel or under the breasts and rarely intravenously: also venesection. Although brought up on the dangers of this last procedure, I have been converted to it as a valuable aid in treatment. Eight ounces of blood are withdrawn if the blood pressure is over 160 mm. Hg systolic and this is repeated daily if necessary. Since adopting this form of treatment the incidence of cerebral hemorrhage has been lowered.

SUPPLEMENTARY MEASURES

Nursing.—This is at least 50 per cent of the treatment. The nurse must be given directions especially when the patient has a fit. In addition, we have volunteers from among the postgraduates, to look after the patient. Everything must be ready, the gag, the bullet forceps to catch the tongue, the mucus extractor, the spoon with handle bound, or the toothbrush to slip in between the teeth. During a fit mucus pours from the mouth like water from a tap, and during a fit the patient must be brought over with her face to the ground, the tongue brought forward, and the mucus removed or she will surely die. She is placed in a quiet room, *not dark*, and morphine is given. She lies on the side. If she is conscious a purge such as the mist sennae co. of the British Pharmacopoeia is given, colon lavage, gastric lavage, submammary infusion.

Morphine.—This is a beneficial drug: it controls the fits and the fewer the fits, the better the prognosis. Morphine raises the Co_2 combining power of the blood and this is of value. Its disadvantage is its effect on respiration. The rate may go down to 4 or 6 per minute, but atropin and oxygen are used to combat this.

Our routine consists of half a grain with the first fit, and a quarter of a grain with each fit *up to two grains in the twenty-four hours*, but two hours must elapse between each dose, that is, if the first dose is at six, the next not to be before eight, the next ten, and so on.

Colon Lavage.—Colon lavage is repeated when necessary, that is if the bowels do not move satisfactorily in six hours. Occasionally it may be repeated again but a third lavage is scarcely ever necessary. The bowels should move four or five times daily. Also if urine is not being secreted, repeat the lavage, as the toxemic condition is preventing the kidneys from functioning. Linseed poultices are applied to the loins at two-hourly intervals to favor urinary secretion.

Gastric Lavage.—This is done when vomiting is a marked symptom or when the patient is so unconscious that the only means of giving a purgative is by the tube.

Gastric lavage increases shock so that it is only carried out when urgent symptoms demand it. A purgative such as 3 ounces of mist sennae co. is left in the stomach.

Submammary Infusion.—If the patient is not improving, if the pulse is weak and thready, and if there is insufficient secretion of urine, sodium bicarbonate solution, one drachm to the pint, is infused under each breast. This is an important part of the treatment. The temperature of the fluid should be between 110° and 115° F., and the strictest aseptic precaution should be taken, otherwise extensive infection and sloughing of the parts may follow. It should be repeated if the symptoms do not improve. No matter what theoretical objections are advanced to the administration of fluids under the breasts, we still persist and believe in it as a valuable adjunct in treatment.

Treatment with regard to birth: Forceps are applied when the head is in the lower strait and all conditions are fulfilled. Ether is the anesthetic chosen. Chloroform is a heart depressant and must be avoided.

Other points: If a woman with eclampsia recovers and the baby is not delivered, she often goes to full term. If, however, there is the slightest sign of recurrence, labor is induced. A woman who has had eclampsia is liable to recurrence, and she should not be allowed to become pregnant until she has been albumin free for six months. Even then, she must be carefully watched in pregnancy. Our results will be given at the end of this paper.

Hyperemesis Gravidarum.—In collecting information from other institutions, it was easy to see that the name hyperemesis was often misunderstood. In this communication the name implies excessive vomiting accompanied by marked constitutional symptoms and definite signs of toxemia. The true toxemic condition is now easily diagnosed from the so-called reflex neurotic. We do not believe in reflex, and the neurotic can be cured without difficulty after ruling the toxemic condition out. Theories other than those mentioned at the beginning of the communication will not be discussed. Probably the acidosis which is present is very vital but it does not tell us how it occurred. If a patient who has recovered from hyperemesis is given the smallest amount of food too soon, there will be a recurrence, with in all likelihood a fatal issue.

The cases at the Rotunda are dealt with as follows: If albumin is present in the urine, kidney function tests are done, but these are unnecessary if the clinical symptoms which accompany the albumin are very marked. If there is no albuminuria, the Fouchet test is done: if it is positive the case is one of toxemia; if not, and there is no albumin, the case is neurotic. There is an exception to this, the possibility of such nonpregnancy conditions as gastric ulcer, cholecystitis, appendicitis, and pyelitis. Once the diagnosis has been made, treatment must be active, and in this connection it is of interest to read the treatments adopted at some of the maternity hospitals from whom enquiries were made.

Queen Charlotte's: Termination when truly toxic.

Essen Möller at Lund: Two days without food, not even water. Rectal injections of fluid, in more severe cases insulin. No abortion induced for thirty years. (He does not say if there has been any abnormality.)

Sheffield: Severe cases are rare. Emptying the uterus, rectal glucose and graduated diet.

Manchester: 127 cases, 98 cured, 27 evacuated, 4 deaths.

New York Lying-In: Intravenous glucose, normal saline, corpus luteum, carbohydrates.

Coombe: Purgative, forced fluids, glucose in isotonic strength. Gastric lavage. Lugol solution Miii, t. i. d. p. c.

Bristol: Calcium. Glucose. Vitamin D. Evacuation.

Cardiff: Isolation from relatives, full feeding, attention to bowels.

It will be seen by these notes that the treatment is varied. In five years at the Rotunda, there were only 24 cases which could be called true hyperemesis. There were three deaths, a mortality rate of 12.5 per cent.

The treatment adopted is (1) gastric lavage with purgatives left in stomach, (2) glucose by mouth if possible, otherwise by rectum, under breasts, and in severe cases intravenously. Colon lavage is done in severe cases. If urine is not being secreted, linseed poultices are applied to the loins: calcium gluconate and radiostoleum appeared to have some success in a few instances but this treatment was absolutely unsuccessful in other types of toxemia. In this our results differed from those of Cameron[21] although he used practically the same technic. We have tried every treatment that has been suggested, decapsulation, insulin, corpus luteum, the injection of the blood of a woman pregnant about the same period, but in really severe cases the only treatment is evacuation of the uterus. The best method during the first three months is by vaginal hysterotomy, in the next three months vaginal or abdominal cesarean section. Once the child is viable induction by puncture of the membranes suffices. Evacuation should be done, if in spite of treatment the pulse rate becomes irregular and more rapid and the laboratory tests remain unchanged. The general appearance of the patient is of supreme importance, the pinched haunted look with slight icterus will often decide the issue.

Accidental Hemorrhage.—It is of great interest to find that this is not included either in the work of Cruickshank or of Stander. The time has come to include it among the toxemias.

A true toxemic accidental hemorrhage is indeed a toxemia. Everything points to it. All observers who have tried to theorize on this subject have failed to find a solution. There is no doubt that there is bleeding between the muscle bundles, but what causes the bleeding? Some toxin? But no one has succeeded in making any *convincing* observation as to the obvious train of symptoms.

We do not intend to theorize further except to suggest that, as excessive swelling of the endothelium of the vessels of the uterus is a marked feature, loss of arterial endothelium occurs, with transudation of blood, through the vessel walls. It is easy to visualize a flow of this escaped blood through the uterine muscle towards the placental site, which may cause hemorrhage behind the placenta, forming a hematoma which not only separates the placenta but makes its way into the substance. In addition to this, disintegration of the muscle fibers allows the hemorrhage to separate them; and the contractible power of the uterus is lost. Gradually this hemorrhage may increase and bleeding occurs into the

uterine cavity and into the serous surfaces. Hemorrhages also occur in the decidua, even into the amniotic cavity and the fetus gradually dies. This is borne out by postmortem examination of the uterus. It is also borne out by the appearance of blood on the serous surfaces of the uterus, in the broad ligaments and in the abdominal cavity. In addition the appearance of serum at the vagina, squeezed from the uterus as the juice is squeezed from an orange, is further confirmation. The exact cause cannot be ascertained; it is different to that of eclampsia; it is nearly always present in multiparae, in fact, so true is this that a primigravida diagnosed as accidental hemorrhage is most likely to be a placenta previa.

Diagnosis is easy; the patient is nearly, but not always, a multipara with symptoms of severe collapse, thready pulse, etc., a uterus painful and tender with impossibility to feel fetal parts, no fetal heart, a vaginal examination revealing membranes bulging and no placenta.

Our treatment will now be considered, and it is of great interest to be retrospective. On considering the various treatments which have been carried out at the Rotunda, it will be found that there has been a gradual feeling against radicalism, and the mild measures have been attended by improved results. During recent years the following treatments for severe concealed accidental hemorrhage have been carried out: Vaginal plugging, nearly invariably fatal; cesarean hysterectomy, fatal; cesarean section, a great improvement; and the present treatment.

One of the most dramatic episodes the writer has witnessed was the first time he saw a uterus left in the abdomen with hemorrhage exuding from the serous surfaces, from the peritoneum of the broad ligament, from the pelvic walls, and the patient recovered. But the results were not good and the treatment which is now carried out obtains most extraordinarily good results, but the details as in eclampsia must be meticulously observed. The treatment is the same for the severe as for the mild cases, except that the former will require more saline and stimulants. When the patient is admitted she is surrounded by hot water bottles, given two pints of saline under the breasts. Then the membranes are punctured, and pituitary extract given in 2½ unit doses every quarter hour, until if necessary 20 units are given. Delivery takes a variable time but usually four to eight hours sees the termination of labor. The pulse rate must be carefully observed and any increase indicated stimulants and repeated submammary saline. In a severe case intramuscular injections of ephedrine, brandy, ether are given at hourly intervals. Morphine is a routine standby.

Patients do not die of concealed accidental hemorrhage, if the condition is diagnosed in time and the measures suggested are adopted. But the pulse must be carefully observed and any sudden increase in its rate calls for immediate action.

In the five-year period there were 132 cases of toxemic accidental hemorrhage with 5 deaths, a mortality rate of 3.78 per cent.

Prenatal Care.—Prenatal care will prevent the occurrence of many

cases of eclampsia, but it will not prevent eclampsism with sometimes fatal results. It should however be insisted upon as the incidence of mortality will be more lowered by care and timely induction in the prenatal period.

Prenatal care is useful in hyperemesis, inasmuch as advice can be given before it occurs; when it is present appropriate treatment can be carried out before the patient is fatally ill.

The onset of accidental hemorrhage is usually so acute that prenatal care at the moment has very little effect on prognosis and treatment.

A SUMMARY OF CASES OF TOXEMIA OF PREGNANCY DURING FIVE YEARS AT ROTUNDA HOSPITAL.

1926-1927

1979 deliveries in Hospital
1768 on the District

Albuminuria	360	No death
Eclampsism	21	No death
Eclampsia	12	2 deaths

Treatment same as previously except glucose was started. Morphine reintroduced for eclampsia. Pituitary extract in small doses during colonic lavage. This was done because it had been stated that in small doses pituitary extract had no effect on blood pressure. I proved this to be definitely untrue. A dose of two and one-half units cause a rise in blood pressure so that the use of pituitary extract in this connection was discontinued.

In this year's report, the necessity for revision in nomenclature of eclampsia was suggested.

Twelve cases of eclampsia, 2 deaths, one from puerperal sepsis. The other case was a questionable eclamptic. She had one fit a few seconds before death, probably a death rattle.

Accidental Hemorrhage	23 without mortality.
	20 were toxemic.
Hyperemesis	3, with one death.

This case admitted with icterus. Albuminuria, acetone, diacetic acid. Induction March 24, birth 27, Mors April 3. Minor cesarean section would have been a better treatment.

1927-1928

Intern.		*Extern.*
2062		1717
Albuminuria	608	no death
Eclampsism	28	1 death
Eclampsia	18	1 death

Biochemical investigations continue to be made; they are helpful but not conclusive.

Fatal eclamptic . B.M.J. July 1928

Admitted with definite eclampsism; six hours after delivery fits started; eight in rapid succession. Fifteen hours later respirations ceased but pulse remained for two and a half hours P.M. Cerebral hemorrhage.

Accidental Hemorrhage	41 cases	1 death
	25 toxemic	
	Previous toxemics, 7	

Toxemic Death.

M. C. A primigravida, thirty-five weeks, fits before admission. Blood pressure 118 mm. Hg.

This case has already been described.

Eclampsism.

Death due to cerebral hemorrhage into the left ventricle and medulla.

Hyperemesis 6 cases no death

1928-1929

Intern.		*Extern.*
2034		1805
Albuminuria	564	no death
Eclampsism	43	no death
Eclampsia	9	1 death

Fatal case, typical, para ix of forty who died of sepsis with bronchopneumonia. She had chronic interstitial nephritis. Extract from this report reads:

"Prognosis for the multiparous eclamptic very grave and I dread her advent in the hospital." (Rotunda Report.)

Accidental Hemorrhage. 43 cases two deaths,

1. Attended outside, refused to come in, until moribund;
2. Sent up with plugged vagina. P. P. H. Mors.

25 Toxemic
6 repeat

Hyperemesis 5 cases 1 death

Fatal case . . . vomiting at five months which continued for two weeks before admission. Patient dehydrated, jaundiced, emaciated. No stomach resonance. Fouchet positive. Spontaneous labor at twenty-eight weeks. Deaths three days after delivery. P. M. Interstitial hemorrhage into uterus. Kidneys showed diffuse fatty degeneration of epithelium of convoluted tubules. Glomeruli distended with engorgement of blood. Interstitial fibrosis. This is acute on chronic interstitial nephritis.

Liver: Congestion around central vein with degeneration of liver cells. Old blood in this area. Cells in periphery cloudy, swollen.

1929-1930

Intern.		*Extern.*
2258		1724
Albuminuria	639	"Is it a normal occurrence?" (Report)
Eclampsism	37	3 maternal deaths.
Eclampsia	8	3 maternal deaths.

Eclampsism.

1. Primigravida; blind, nystagmus, vomiting. Cesarean section, recovery. Mors, four days later with mental symptoms.
2. Cyanosed and moribund. Fibrillation.
3. Eclamptic without fits. Blindness. Mors in twenty-four hours.

All three eclamptics had severe cerebral hemorrhage.

Accidental Hemorrhage. 41 cases Toxemic. Normal previous pregnancies.

1 death

Fatal case. Para viii, secreted no urine during the five and one-half hours in hospital.

Acute Toxemia.

1. Para. An unusual toxemia; half an hour after birth, collapse. Hematoma of perineum and vagina without laceration. That is, general hemorrhagic infiltration of

vaginal wall and cervix. Uterus and vagina plugged. Death. No free blood in abdominal cavity but uterine sinuses unusually open. Albumin present in P. M. specimen.

Hyperemesis. 7 cases
1 death

Vagina covered with thrush, also mouth. P. M. Huge intestinal distention and pure blood in cerebrospinal fluid. Vomiting three weeks before admission.

1930-1931

Intern.		*Extern.*
2169		1755
Albuminuria	738	no death
Eclampsism	19	1 death
Eclampsia	11	1 death

Three toxemias of unknown nomenclature.

1. *M. C.*, para x. No prenatal care. Fit twenty minutes before death. P. M. Report atypical.

2. *E. P. McG.*, para iii with two previous normal births. Two fits prior to admission, recovery, then 29 fits, followed by death.

3. *T. A.* Pallor, cyanosis, vomiting. Two days postpartum very drowsy and died. P. M. Bronchopneumonia. No other abnormal signs.

Accidental Hemorrhage. 33 cases, 1 death
21 Toxemic
1 Repeat Toxemia
Hyperemesis. 3 cases
Total Deaths. 1 Eclampsism
1 Eclamptic
1 Accidental Hemorrhage

Eclampsism. Para i. Eclamptic without fits. Admitted for induction because of increasing albuminuria. Routine treatment. Low forceps. *Baby toxemic*, died two days later. P. M. Toxemia.

Eclampsia. Para ii. Deep coma on admission. Never regained consciousness and died with pontine hemorrhage.

Accidental Hemorrhage. Moribund on admission. Did not respond.

RESULTS OF FIVE YEARS OF TOXEMIA AT THE ROTUNDA HOSPITAL

Only the first five years of the present Mastership are considered. During this period, there were 10,502 internal cases and 8,719 external cases. As severe toxemic cases are all admitted to the hospital, it seems wise to consider 19,221 cases altogether.

Of these there were

Eclampsia	62 cases	8 deaths	12.9 per cent
Eclampsism	128 cases	4 deaths	3.1 per cent
If both are taken together	190 cases	12 deaths	6. per cent

The cause of death will be found in the Rotunda Hospital Reports.

There were 2,899 cases of albuminuria with no deaths. There were 3 cases of toxemia to which it was impossible to give a name.

These were chronic nephritic cases according to the postmortem examination. But they all died.

Toxemic accidental hemorrhage	132 cases	5 deaths	3.78 per cent
Hyperemesis gravidarum	24 cases	3 deaths	12.5 per cent

In all excluding albuminuria otherwise than eclampsia without fits, i. e., eclampsism, 349 cases, 23 deaths, 6.3 per cent.

SUMMARY AND CONCLUSIONS

1. The subject of toxemia of pregnancy was chosen because so many points regarding diagnosis and treatment are still inconclusive.

2. The cause of these toxemias is still unknown. If theories as to causation are to be of assistance, successful clinical results must follow their application. The two theories, especially in regard to eclampsia in which food and placental toxins play the chief part, seem to be valid, as they conform to this rule. If patients can be persuaded to attend prenatally they should not, as a rule, die. If they do not attend, no treatment will be of avail in some instances, as cerebral hemorrhage may occur. Of the 8 deaths in this series, 5 had cerebral hemorrhage as shown at autopsy and two died of puerperal sepsis.

3. The varieties of toxemia are numerous. They might be divided into (a) common, (b) rare. Under the former heading would be included albuminuria with marked toxic symptoms, eclampsism, eclampsia, hyperemesis, and accidental hemorrhage.

4. Prenatal care must be insisted on. Results will be better, but there will still be a small mortality.

5. The Fouchet test is a simple and valuable test for liver involvement.

6. The nomenclature of eclampsia must be decided on at an International Congress.

7. The results of an investigation of the eye in toxemia are given.

8. In evaluating statistics of hyperemesis gravidarum investigation should be made as to whether those cases are truly hyperemesis. There is no cure for some of these cases except evacuation of the uterus which can sometimes be carried out gradually; at other times it must be immediate.

9. Toxemic accidental hemorrhage, as its name implies, must be classified as toxemia. It is nearly always curable if treated as soon as it is diagnosed.

10. A summary of cases of toxemia of pregnancy during five years at the Rotunda Hospital is given in which the mortality statistics for eclampsia, eclampsism, accidental hemorrhage, and hyperemesis gravidarum will be found.

REFERENCES

(1) *Holmes, O. W.:* Medical Essay. 1842-1882. (2) *Dorland:* Medical Dictionary. (3) *Solomons:* Tweedy's Practical Obstetrics, ed. 6, 1928. (4) *Solomons and Bourke:* Irish J. M. Sc. **65**: 222. (5) *Cruickshank, Hewitt, Couper:* Med. Research Council, 1927. (6) *Alvarez:* Physical Rev. **4**: 352, 1924. (7) *Paramore:* Lancet 11, 28, 3, **2**: 914, 1928. (8) *Theobald:* Lancet 31, 10, 31, **2**: 948, 1931. (9) *Browne:* Quart. J. Obst. & Gynec. Brit. Emp. **38**: 3, 528. (10) *Titus:* Am. J. Obst. **14**: 1928-9. (11) *Young:* Quart. J. Obst. & Gynec. Brit. Emp. **34**: 2, 1927. (12) *Stander:* The Toxaemias of Pregnancy, 1929. (13) *Stander and Peckham:* Am. J. Obst. & Gynec. **23**: 4, 461. (14) *Williams:* Obstetrics, 6th Edition. (15) *Solomons and Bourke:* Brit. M. J. **30**: 4, 1932. (16) *Greenhill:* J. A. M. A. **87**: 228, 1926. (17) *Stroganoff:* Treatment of Eclampsia, 1930. (18) *Stander, Ashton, Cadden:* Am. J. Obst. & Gynec. **23**: 461, 1932. (19) *Browne, F. J.:* Brit. M. J. Feb. 20, 1932. (20) *Bollman:* Proc. Staff Meeting, Mayo Clinic, **4**: 369, 1929. (21) *Carmen et al.:* Quart. J. Obst. Gynec. Brit. Emp. **2**: 343.

NEW METHODS OF STUDY APPLIED TO MATERNAL MORTALITIES IN THE HOSPITAL*

A. J. SKEEL, M.D., F.A.C.S., CLEVELAND, OHIO
(Director Division of Obstetrics, St. Luke's Hospital)

HOSPITAL standards are established for the purpose of increasing the average of efficiency. If we are to improve our standards, we must have an accurate measuring stick for testing the end-results.

During the last decade the challenge has been rather sharply made by certain medical authors, and by an increasing group of lay writers, reflecting their opinions, that the general hospital is not a safe place for the care of obstetric patients. To be more specific, the statement is made that patients delivered and housed in a general hospital, are subjected to undue risk from septic infection.

Statistics are being compiled to support this view, and are even finding their way into obstetric textbooks. Obstetricians responsible for the conduct of maternity wards in good hospitals, knowing intimately the conditions in their own institutions, have understood the fallacies behind many of these conclusions, and secure in this knowledge, have generally ignored these charges. The recent appearance however of an article by a lay writer, in a publication of national circulation, urging women to avoid the "flaming death" of septicemia, by remaining at home or going to a specialized maternity hospital, supporting this view by quotations from an obstetric authority of high standing, should not go unanswered.

The maternity ward in a general hospital, must defend its right to exist as such, must show that the safety of its patients is adequately safeguarded; or tacitly admit as its detractors charge, that it is a mere makeshift, defensible only because of lack of more adequate facilities.

Tables of hospital deliveries and mortalities, as compiled by our Bureaus of Vital Statistics, give rise to several subjects for discussion.

First.—Tables which make comparisons between hospitals, based on the ratios between live births and puerperal deaths. The inference is lightly made that the puerperal death rate for a hospital is a criterion of the safety of that hospital for child-birth. The tables of the Cleveland Health Office for 1931 make the following comparisons.

PLACE OF BIRTH	LIVING BIRTHS	PUERPERAL DEATHS	DEATH RATE PER 1000
Home cases	6516	19	2.9
Maternity hospitals	3519	20	5.7
General hospitals	6235	70	11.1
Hospital totals	9754	90	10.

*Read at the Forty-Fifth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, French Lick Springs, Ind., September 12, 13, and 14, 1932.

Any lay reader might and (to judge from the literature) many medical readers do, conclude that child-birth is relatively safe at home, quite unsafe in a maternity hospital, and positively dangerous in a general hospital. Puerperal deaths consist of deaths from delivery, plus, deaths from abortions, miscarriages, ectopic pregnancies and all the other mishaps of early pregnancy. There is therefore no way to rationalize the computation of ratios between *births* and *puerperal deaths*, as a hospital study. These tables offer no information as to hospital efficiency, or as to comparative merits of various hospitals.

Maternity hospitals have practically no puerperal deaths except delivery deaths. Good maternity hospitals properly refuse to admit abortions, miscarriages, etc., because it is unsafe to house them in maternity wards, or to care for them with the maternity nursing personnel. The general hospital accepts these cases in its medical and surgical wards, and if death ensues, it is a puerperal death occurring in that hospital. These deaths plus delivery deaths are then checked against the number of births, in estimating a puerperal death rate for the institution. A high *puerperal* death rate in a *general* hospital indicates merely that the institution has a large gynecologic and surgical service. It throws no light whatever on the quality of its obstetric service: The measure of the efficiency and safety of a maternity service, is not the *puerperal* death rate of the hospital, but the *delivery death rate* of its *maternity service*. This criterion is accurate for the maternity hospital, and equally so for the general hospital. The *puerperal* death rate and the *delivery* death rate of a maternity hospital may not be far different, but in a general hospital with active gynecologic and surgical services the *puerperal rate* is often twice that of the *delivery rate*.

Second.—The method of calculation of death rates is wrong. Child Welfare Bureaus and sociologists are interested in ascertaining the total number of maternal lives lost in producing, e. g., 100,000 live babies, and our vital statistics setup is based on this study. The number of deliveries occurring in a hospital however, is the number of live births plus the number of stillbirths. A birth in our sense is the delivery of a viable fetus. The death rate should not be raised by estimating it from live births instead of from total births.

Figures were obtained from the Cleveland Health Office, showing the period of intrauterine gestation, for each of the puerperal deaths charged against Cleveland hospitals for 1931. We took six and one-half months as a basis for separating viable from nonviable cases. The regular tables gave us the number of stillbirths, which we added to the live births to obtain the number of deliveries.

We found 17 delivery deaths and 3 previable deaths at the maternities, while the general hospitals had 36 delivery deaths and 34 previable. The official tables showed 110 stillbirths at maternities and 240 at general hospitals. Tabulating the comparative results we have the following:

	OFFICIAL FIGURES PUERPERAL DEATHS PER 1000 LIVING BIRTHS	DELIVERY DEATHS PER 1000 LIVING BIRTHS	CORRECT FIGURES DELIVERY DEATHS PER 1000 TOTAL BIRTHS
Maternity hospitals	5.7	4.8	4.7
General hospitals	11.1	5.8	5.5
Hospital totals	10.	5.4	5.2

The general hospital ratio is diminished from 11.1 to 5.5 and the total hospital figures from 10 to 5.2 by correct analysis. The official Cleveland figures are not unique, but are standard forms. Why do we permit the publication of an anachronism so misleading regarding hospital efficiency for obstetrics as a whole, and equally misleading when used to compare the relative safety of different types of obstetric services? The entire cause of American obstetrics is suffering from a lack of appreciation of the difference between puerperal death rates and delivery death rates. Puerperal death rates are a more appropriate subject for a Sunday morning sermon than for comparison of hospital mortalities.

We turn again to Cleveland's official tables. The Cleveland City Hospital had 884 deliveries, with 12 viable and 13 previable deaths. It is like most other city hospitals, a dumping ground for infected cases. Omitting the City Hospital from the list, in order to get a fair idea of the average work of our general hospitals, we find the delivery death rate of the general hospitals, to be 4.5, that of the maternities was 4.7. Allowing for minor errors in estimating viability, etc., the delivery death rate of the two types of institutions was practically the same.

Comparison of hospital deliveries with home deliveries, basing this comparison on the respective death rates, seems to be a favorite pastime for statisticians and lay authors. Disproportion, placenta previa, eclampsia, and cardiac disease, are the cause of nearly all nonseptic deaths following delivery. Practically all of these become hospital cases either before or during labor. Delivery occurs in the hospital, and if death ensues it is a hospital death. These women are sent to the hospital, because the facilities, technic, and professional skill which the institution provides, can save many of them who would certainly die at home. This is common knowledge, yet we permit without effective protest, the publishing of comparisons which are utterly misleading. The entire subject of hospital maternal mortalities needs detailed continuous study by obstetricians.

THE CLEVELAND PLAN

Early this year at a conference of the obstetric heads of several Cleveland hospitals, an organization was perfected to give this matter continuous attention, and to assemble the information so obtained, in suitable form. Every hospital in the city with an organized maternity depart-

ment, is invited to participate in our conferences. The only requirement is that the hospital shall cooperate by making detailed reports of its own puerperal deaths. For the purpose of this study we have classified these deaths as follows:

A. Puerperal deaths
   (1) Viable (following deliveries)
   (2) Previable (following abortions, ectopics, etc.)
B. Viable
   (1) Septic
   (2) Nonseptic
C. Septic
   (1) Intra hospital infections
   (2) Extra hospital infections
D. Nonseptic
   (1) Sent to hospital for known pathologic conditions
   (2) Admitted as normal cases

We accept 1500 gm., or six and one-half months, as the period of viability. In the nonseptic group fall the cases of late toxemia, eclampsia, late hemorrhages of placenta previa, and ablatio placentae, cases of cardiac disease, shock, early pneumonia, early emboli, etc.

In the septic class we place all the frank infections, the late pneumonias, late emboli, nonobstructive ileus, etc. Patients admitted with fever or developing fever within twenty-four hours after admission, are classed as extra hospital infections. Patients admitted after intrauterine manipulations, such as unsterile packing for placenta previa, prolonged attempts at delivery by forceps or version, are also considered extra hospital infections.

The group consisting of obstetric specialists from the various hospitals, sits as a jury on each case. Each hospital presents its own report without naming either patient or physician. These reports not only give information from the chart record, but additional facts obtained from the attending physician. The reports are checked by our secretary, who obtains from the Health Office, records of all puerperal deaths.

Seven of our general hospitals, with approximately 13,000 births in the years 1929, 1930, and 1931, showed 17 septic cases which terminated fatally. Ten of these were of extra hospital origin. In 7 no extra hospital cause was evident. Not all of these however should be attributed to hospital conditions. Late coitus, self examination, and personal uncleanliness, are well recognized sources of vaginal contamination at the time of labor. It is also apparent that the 10 cases of extra hospital infection, and many other similar cases occurring in other hospitals, should be added to the deaths attributed to home deliveries.

We feel that here is a field, well deserving study over long periods and by many groups. Valuable information of a type not now available could be acquired by this means. It is in the hope of stimulating such group study, that we have presented our plan.

The writer has no desire to defend carelessness in the supervision of obstetric work in a general hospital. Any institution which permits medical, surgical and obstetric patients to be housed in the same units, and to be cared for by the same personnel, is inviting tragedy. He does believe however that the suitably placed obstetric unit, serviced by a properly segregated personnel, and adequately supervised, is safe from the myth of "air borne" infection. At St. Luke's the following precautions are taken to ensure proper isolation of the obstetric division.

A. Labor rooms, delivery rooms, and obstetric surgery, are entirely isolated physically on the top floor, with no corridors connecting with any other part of the hospital.

B. Patients' rooms, nurseries, etc., on the third floor, directly beneath the delivery rooms. The connecting corridor is closed by folding doors, which may be opened only for purposes of fire or other emergency.

The following rules and regulations are rigidly enforced:

1. Before student nurses begin their services in the maternity department, they shall be away from the hospital for a day. During the day, they must take a bath, shampoo, change all their clothes and have their shoes cleaned.

2. (A) No nurses who are working in the maternity department shall be permitted to work in other departments. (B) Nurses working in other departments shall not be permitted to work in the maternity department.

3. All nurses working in the maternity department must pass a rigid inspection of fingers, hands, and arms, by the resident or the assistant resident and the supervisor of obstetrics, when they come on duty.

4. Maids and janitors working in the obstetric department, must pass a daily inspection before they begin work.

5. All linen from the obstetric division shall be laundered separately from the other hospital linen.

6. Patients with fever or other evidences of infection, shall be promptly removed from the obstetric division.

There will of course be many necessary variations from the details of these rules; but any hospital general or specialized must accept the principles of isolation upon which these rules are based, if its patients are to be adequately protected.

CONCLUSIONS

The ratio of puerperal deaths to live births in hospitals, throws no light on their relative efficiency. The custom of presenting such comparisons for this purpose is misleading and should cease.

Properly administered and well supervised obstetric departments, whether in general hospitals or in specialized maternities, show similar obstetric mortalities, although their puerperal mortalities may be quite different.

We have presented a simple and inexpensive plan for continuous study of obstetric mortalities as found in our large city hospitals. We believe that such group studies will lead to more careful diagnoses, stimulate autopsies, and develop improved methods and higher standards.

10515 Carnegie Avenue.

ABSTRACT OF DISCUSSION

DR. JAMES R. McCORD, ATLANTA, GA.—Obstetric mortality must be considered in terms of obstetric care and obstetric environment. It is my opinion that the improvement of obstetric environment is more rapid than that of obstetric care.

In considering the mortality statistics of the average maternity hospital and the average general hospital, I think that the difference is not because of the hospital, its system, isolation, etc., but because of the better obstetric judgment that is more generally obtainable in the maternity hospital.

Dr. Skeel made the following statement, "The entire subject of hospital maternal mortalities needs detailed continuous study by obstetricians."

I would paraphrase that sentence as follows: The entire subject of hospital maternal mortalities needs detailed and continuous teaching, by obstetricians, of physiologic labor along safe, sane, and conservative lines.

It has been my privilege to assist in the individual study of some 7500 maternal deaths occurring in this country. Of those deaths that were probably preventable, where lay the fault? In a certain number unquestionably with the patient herself—but in a vastly larger group the fault was an error of obstetric judgment. Hospitals, equipments, systems, nurses pale into insignificance when compared with a thorough knowledge of the physiology and mechanism of labor. I have made the statement many times that if obstetric mortality and morbidity are to be permanently improved in this country, it will be because medical schools are consistently graduating doctors well trained in the fundamentals of the obstetric art. To obtain the maximum of improvement, women must be educated to an appreciation of the fact that obstetrics is an art—and taught what good obstetric care really is. Studies of maternal mortalities, as outlined are instructive and stimulating, but in the final analysis obstetric mortality is a direct responsibility of our medical schools and obstetric teachers.

DR. JAMES R. MILLER, HARTFORD, CONN.—When we consider our figures for hospital delivery mortality, I think we should also compare certain other data, such as population of the different cities, or the percentage of hospitalization which occurs in any community. Where Negroes, French Canadians, Irish, or Poles are numerous the mortality is likely to be higher. In communities where Russians, Italians and Jews make up the largest part of the hospital population the mortality should be very low.

I can second the idea put forth by Dr. Skeel that the separate unit in a general hospital can be run successfully with a low mortality. Our hospital has made a study, covering fifteen years and the mortality is shown to be under 0.28 per cent, in spite of a very liberal use of cesarean section and of interference with low forceps. This covers the private cases. My own experience on the ward service for over twelve years shows an exactly equal rate. So we feel that the restrictions put upon the general hospital are not thoroughly warranted. The hospitalization figures in Hartford run up to 87 per cent, and, of course, our statistics are diluted by a large number of normal cases. If one compares the death rate reported by DeLee for the Lying-In Hospital in Chicago, 0.237, with the Royal Maternity in Glasgow of 2.7, it is obvious that it is *not* eleven times more dangerous for a woman to have a baby in the latter hospital than in DeLee's. The whole setting of the institution has to be taken into consideration. The Royal Maternity is the dumping ground for all bad obstetrics. In comparing different institutions these differences must be kept in mind.

DR. CHARLES S. BACON, CHICAGO, ILL.—I agree that there should be a change in the way of collecting statistics. To compare delivery statistics with the statistics including all the postabortal deaths is confusing. The number of deaths following abortions may vary greatly; I believe they have increased in recent years. That, of course, would increase the puerperal death rate. There should be, then, a delivery death rate and a postabortal death rate considered separately.

The efforts that are being made in Cleveland to have cooperation of the hospitals in maternity records, seems to me of great importance. So far as I know that has not been done in any other large city, and it cannot result in anything but a great improvement, not only in the study of the maternal death rate and maternal morbidity, but also in the improvement of the technic. Unless that is done, can we expect any improvement in obstetric teaching? The teaching is done largely in the fifth year, on the interne service. If the interne teaching is not done properly, didactic teaching will be of little value. This cooperation of the maternity divisions of the hospitals should improve not only the interne teaching but the general technic, which will go far toward improving the statistics.

DR. SKEEL (closing).—Dr. Mendenhall is quite right; this is a protest against the publication for general consumption of figures comparing the work and efficiency of general hospitals and maternity hospitals, on the basis of puerperal mortality instead of delivery mortality. We merely analyzed the official figures, and showed that the delivery death rate of the two types of institution were the same. This shows the fallacy of the present methods of comparison.

The group study method has proved very satisfactory in Cleveland. It has developed a proper basis of classification, and shows the erroneous conclusions arrived at by older methods.

Another advantage of such a group organization is: when we as a group make certain recommendations for hospital care of patients, that recommendation goes to the hospital superintendent with more authority than when merely urged by a member of his staff.

With regard to home delivery death rates, we have been able to demonstrate that home deliveries in Cleveland are practically normal deliveries. If a patient has demonstrated disproportion by long labor at home she is sent to the hospital; if she develops eclampsia, she is sent to the hospital; if she shows signs of placenta previa, she is sent to the hospital. Yet comparative death rates are published as if the two conditions were parallel. Some writers accept these comparisons as if they demonstrated hospital inferiority. In fact they demonstrate its recognized superiority.

Matters, R. Francis: Torsion of Ovarian Cyst With Bradycardia. Brit. M. J. **1**: 1022, 1931.

The author reports a case of torsion of a parovarian cyst in a twenty-year-old girl with a preoperative pulse rate of 32. The pulse slowly returned to 84 shortly after the operation. An inflamed appendix was also found. The writer theorizes that the torsion stimulated the vagus nerve thus slowing the heart, producing this deceptive sign of peritoneal involvement. ARTHUR B. HUNT.

Stahnke, E. N.: Diminution of Pain in Operative Gynecology and Obstetrics. Monatschr. f. Geburtsh. u. Gynäk. **87**: 144, 1931.

The anesthetic which has the lowest mortality is ether which causes on the average only one death in 5,000 cases. The next safest anesthetic is lumbar anesthesia. The German figures for nitrous oxide are unsatisfactory. The death rate from avertin has not yet been determined. Where deaths from postoperative pneumonia are considered, ether exacts the greatest toll. Concerning damage to the heart and blood vessels, nitrous oxide is the greatest offender, and ether the next. Likewise lumbar anesthesia and avertin produce disturbances in the circulatory apparatus. Nitrous oxide and lumbar anesthesia, on the other hand, never cause damage to the liver and kidneys but avertin produces serious and ether mild disturbances. Lumbar anesthesia is the only one which brings about nerve injuries.

PREVENTION AND CONTROL OF MORBIDITY AND MORTALITY FROM PUERPERAL INFECTION BY STATE OR MUNICIPAL SUPERVISION AND INSPECTION*

CHARLES S. BACON, PH.B., M.D., D.SC., F.A.C.S., CHICAGO, ILL.

ACCORDING to the International list of the causes of deaths that is now adopted by the United States Census Bureau, puerperal infection comes under three headings: Abortion with septic conditions (Heading 140), ectopic gestation with septic conditions (142a), and puerperal septicemia (145). It should include puerperal phlegmasia alba dolens and septic embolism, which are now combined with sudden death in heading 148. The mortality rate is generally computed as the ratio of puerperal deaths to one thousand live births. When deaths from abortion are included in puerperal mortality it would evidently be more reasonable to compare the number of deaths with the number of both live and dead births, including under the latter term all abortions. Because of the difficulty of getting reports of abortions and for other reasons, the other method of calculating death rates is generally adopted. What particularly interests us in obstetric practice, however, is the delivery mortality rates, i. e., the ratio of the number of delivery deaths to the number of children of viable age both dead and alive. Abortion is quite another obstetric problem. The causes of intra- and postabortal mortality are so different as to require special consideration and the treatment of abortion is quite different from that of labor with viable child. The cases are also handled in special departments of hospitals. Moreover the frequency of abortion varies in different periods and if its statistics are combined with those of labor and puerperium, they will cause confusing fluctuations. We shall be obliged, however, to base our discussion on the generally accepted mortality tables.

We do not propose to compare the puerperal mortality in the United States with that of other countries nor that in the different states or cities or rural districts nor that in hospitals versus homes. Several recent papers by both American and European writers have made valuable contributions to these questions. We start out with the generally admitted fact that the mortality rate is higher than necessary and that in the country at large it has not decreased much in recent years. Only puerperal infection is considered because that is in the list of reportable infectious diseases in many states and hence, the principle is already established that it is the duty of the state to seek to control it. No serious effort has yet been made, however, by any state to carry out a system of adequate supervision of hospitals and private practice that would procure results. We shall attempt

*Read at the Forty-Fifth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, French Lick Springs, Ind., September 12, 13, and 14, 1932.

to show that because of the failure of other efforts the states should now undertake this task.

The methods of supervision and inspection would probably differ in different states. Whether it be undertaken by the State Department of Health or Department of Public Welfare, or whether it be delegated to municipal or local health bodies will depend upon the organization that has developed and that now functions in different states. If the need of supervision is recognized in all the states and the right and duty of the state to interfere is accepted, the ways will be found.

Probably some uniform system of hospital scoring would eventually be introduced. On score cards, similar for example to those used in milk control, would be recorded, the rating of the hospitals in equipment, organization of the maternity service and performance. The relation of morbidity to mortality, i. e., the number of cases of puerperal infection to the number of deaths would be established as it is now done in the Appraisal Form for city health work of the American Public Health Association. Scoring of the maternity work in the different cities, towns, and rural districts could be carried out in a similar way by the state department.

In introducing hospital supervision and control of puerperal infection, it might be well for certain cities to experiment and try out their own plans in order to find out which works most satisfactorily. The best way to secure hospital and professional cooperation, determine the requirements for hospital equipment and organization, and the frequency and nature and cost of inspection, etc., could thus be established. An attempt to secure agreement upon the principles underlying state inspection and upon the best way to carry it out could be made by discussions at the annual meeting of the State Health Officers with the Surgeon General of the United States Health Service. Naturally the matter would also come before the American Public Health Association, as well as the American Medical Association, the American College of Surgeons and other medical societies.

The state can, and does, exercise authority over physicians and hospitals in the matter of vital statistics, when it requires reporting of births and deaths, and specifies how reports shall be made. In other ways also the state shows its power to control medical practice. Physicians, midwives, and nurses must be licensed after examination, and their licenses may be revoked for incompetency or misuse. Hospitals also must procure licenses and this implies the right of the state to inspect the character of the personnel, the equipment, the rules, and the management. Likewise the state has the right and the duty to prevent and control contagious diseases. This gives the state the right to inspect maternity hospitals, demand proper equipment and the establishment of rules for the prevention and control of puerperal infection, because this is an infectious disease. In the case of patients delivered in their homes, infection is in the same category, reportable infectious diseases, as other kinds of infection or contagion,

like scarlet fever or typhoid. Reports of cases of puerperal infection can be required, and if deaths occur where no report has been made, the attending physician can be punished as when death occurs in a case of unreported scarlet fever.

Other methods of preventing mortality from puerperal infection have proved insufficient. The Fellows of this Association know that the mortality from puerperal infection over the whole country has not been substantially reduced in the last fifteen or twenty years. This is true in spite of efforts on the part of members of the profession and of the laity. Better obstetric teaching has been advised and better training of nurses and midwives; prenatal clinics have been established. For seven years under the operation of the Sheppard-Towner Law, the resources of the general government were added to those of states for this purpose but apparently with little result. The Sheppard-Towner Law no doubt has caused a considerable lessening in the death rate of infants. It did good in educating the people to the appreciation of the importance of good obstetric care and calling the attention of the medical profession to the needs and demands of the community. It is not unlikely that in time it would have accomplished something in reducing puerperal infection, but that was too big a problem to be solved in seven years. One of the chief aims of those who administered the law was to care for pregnancy through the establishment of prenatal clinics. This was important and probably had some effect in diminishing accidents of pregnancy, including toxemia. Infection occurs, however, during, and shortly after labor and is controlled by prenatal clinics only as they improve the health and increase the resistance of the gravidae.

Better education of medical students and of nurses and midwives ought to accomplish something. Parenthetically, it may be said that midwives have generally been ignored by medical schools and are probably neither better nor worse now than twenty years ago. Their practice is declining in most sections of the country and if infection is more common with them, this fact should show in the improvement of the mortality rates. In European countries which have well trained midwives, the incidence of infection in their practice is said to be less than in the practice of physicians. More attention has been given lately to obstetric teaching of embryo doctors and nurses. Why has this failed to produce results? Didactic teaching does not help much in preventing puerperal infection. Clinical teaching is of chief importance. Here the trouble lies. Few schools have enough clinical material to furnish 25 to 30 cases for each student, the number that is agreed upon as a minimum. Often the cases are not used to best advantage. The most important clinical teaching comes in the interne year. It is given mostly in general hospitals, not under the control of school teachers. Here the student often learns a poor technic and a highly developed meddlesome midwifery. What can be expected of a young doctor emerging from a hospital which has a record of 30 to 50 per cent of forceps operations and a proportional number of versions and cesarean sections done mostly by general practitioners.

The great increase in the number of patients delivered in hospitals, which has now reached about 66 per cent in the cities with hospital accommodations, was at first hailed with joy as promising great improvement in obstetric practice, but recent studies in this country and abroad seem to show that it has not improved the mortality rate from puerperal infection. The number of obstetric operations has increased. Patients are coming to demand short and painless labors. The enormous increase in operative interference is not accompanied by increased operative skill on the part of the physician, nor satisfactory equipment and technic in the hospital. This leads to increased infection that is largely responsible for our failure to improve our mortality and morbidity rates.

One fundamental mistake made by general hospitals that accept obstetric patients is the failure to separate these patients from the rest of the hospital. Frequently no preparation room is provided. Patients are prepared in the surgical preparation room or in the delivery room. No special internes and nurses are provided for the delivery room. Puerperae and medical and surgical patients are kept in the same wards, use the same bedpans, and are cared for by the same internes and nurses. Managers of small hospitals will say that it is impossible to separate obstetric patients and provide separate obstetric and nursing care for them. The obvious answer would be that these hospitals should not be allowed to receive obstetric patients. That would hold for cities where proper accommodations could be found in other hospitals. In small towns, however, this answer would not be accepted. When a small hospital is built, it should be planned so that rooms to be used for maternity patients are separated from the rest of the hospital, so far as possible. Special caution in caring for patients would avoid much of the danger. Frequent inspection of such hospitals would, if wise and thorough, help much.

Efforts have been made by the American Medical Association and the American College of Surgeons to improve hospital methods. Perhaps some progress can be made in this way, but these bodies lack the authority of the state which by its licensing power can command when the associations can only advise. The Cleveland plan of cooperation of the maternity departments of hospitals described by Dr. Skeel, is more promising if it could be generally adopted. While the state cannot, and should not, dictate the practice of physicians, it can require proper conditions in hospitals for safe operative interference and management of normal labor. That such a supervision would be supported by the best hospitals is shown by the results of a questionnaire sent to the hospitals of Chicago a few years ago by Dr. Bundesen, Commissioner of Health of the city. The general plan of inspection and the rules about to be given were generally approved. Well appointed and well managed hospitals have nothing to fear from such a plan and believe that it would be a help to carry out their own regulations. It would be foolish of course to ignore the difficulties in the way of a health administration that should inaugurate such a hospital supervision. Low grade hospitals and physicians would object when their faults were dis-

covered and corrections demanded. No health officer could withstand the political pressure that would be brought to bear upon him unless he had the support of the medical profession and of the welfare-conscious groups of laymen.

The following recommendations for the installation of a system of hospital inspection or supervision including rules for control of puerperal infection are presented for your consideration.

RECOMMENDATIONS FOR HOSPITAL INSPECTION

Puerperal fever is an infection of the birth canal due frequently to mistakes in the technic of delivery or in the care of the patient after delivery and hence is, with few exceptions, preventable. Confinements, like surgical operations can be conducted much better in hospitals than in homes, provided that the hospitals are properly equipped for the care of maternity cases and that proper rules for their management are made and enforced. It is the duty of the Health Department to ascertain that every hospital with an obstetric department has proper equipment and technic which is continuously enforced. For this reason the Department should institute a system of inspection, either by the creation of a Bureau of Hospital Inspection, or by adding full time physicians as hospital inspectors to the proper existing Bureau of the Department.

Besides the duty of helping to prevent and control the spread of puerperal infection, such inspectors could also be entrusted with a similar function in other hospital infections in the medical, pediatric, and surgical departments and in the inspection of the general hospital sanitation.

The persons selected as hospital inspectors should be full time physicians who have had hospital experience, either on the resident or attending staff as well as considerable experience in the management of contagious diseases. They should have tact and common sense and understand that as representatives of the Health Department they are to cooperate with the hospital for the good of the patients and not create antagonism by arbitrary actions.

The inspectors should visit the hospitals frequently, weekly if possible, especially those in which infection is found to exist and those poorly organized and equipped. At the first visit they should see that the preparation, labor and delivery rooms are properly equipped, that an efficient technic in the delivery room and the puerperal wards has been inaugurated and that the records are properly kept. They should see that rules of technic are formulated and posted and if necessary they should assist in making or revising such rules. At later visits they should examine all records of cases with puerperal fever and suggest measures to prevent the continuance of the causes.

GENERAL RULES FOR CONTROL OF PUERPERAL INFECTIONS

The following general rules are recommended to hospitals to prevent puerperal infection.

I. The obstetric staff of the hospital shall be responsible for the formulation of rules, for the management of the delivery room, and for the care of the puerperae and for the carrying out of these rules.

II. To prevent infection during labor the following things should be noted:

a. Vaginal examinations shall be made only after thorough aseptic preparation of both patient and examiner. In making rectal examinations every precaution shall be taken to avoid contamination of the vulva and perineum.

b. A clean delivery room. This implies that the preliminary preparation of the patient including the enema, bath, cleaning and shaving of the genital region, etc., should be done in a separate room and not in the labor or the delivery room. When in an emergency a patient must be prepared in the delivery room, special pains must be taken to clean it after labor. Similar care should be taken after delivery of a patient who has developed fever before or during labor. Every person admitted to the delivery room should be free from any skin or throat infection, and covered with a clean cap and gown. Admission should be restricted to those needed for the conduct of labor.

c. There should be provided in the delivery room sufficient sterile and other supplies for use in any normal or pathologic labor.

d. The delivery room should be in charge of a competent nurse who should have enough assistance so that a nurse with good obstetric training will always be present at every delivery.

e. There should be one or more internes who have nothing to do with pus cases who should be always on call for service in the delivery room.

f. All doctors and nurses conducting or directly assisting in the delivery of a patient should wear masks, sterile gowns, and gloves.

g. Rules for the delivery room should be formulated and posted.

h. As operative interference increases the danger of infection, unnecessary operations should be discouraged, which can be done to some extent by requiring the indications for all operations to be given on the patient's history record before the operation.

As the danger of infection is much increased in serious operations including high forceps, cesarean section, version and manual removal of the placenta, and in the serious complications of labor such as antepartum hemorrhage, convulsions, postpartum hemorrhage, etc., consultation on these cases with members of the obstetric staff or some other recognized obstetric authority should be required in all cases.

III. To prevent infection after labor, special attention must be given to the cleaning of the genital region and to the vulvar dressings.

If a patient has a temperature of 100.4° or over, infectious precautions should be ordered including tagging the bed, a special bedpan, and any nurse caring for her should wear a special gown and gloves.

If a patient has a fever of 100.4° or over twice on each of two successive

days or a chill with high temperature, with symptoms of septicemia or pyemia, she shall be isolated from normal puerperae and cared for by a nurse who does not attend afebrile maternity patients, and who observes all standard rules for the care of patients with communicable diseases.

IV. No operations on patients with incomplete abortion shall be done in the delivery room. Abortion cases with fever shall not be cared for on the maternity service.

V. All cases of fever in puerperium shall be reported daily to the superintendent of the hospital and to the staff obstetrician on service, and such records shall be at all times accessible to the hospital inspector.

VI. All cases requiring isolation as described in Rule III shall be reported to the Health Department.

In the control of infection in patients delivered in their homes, reliance must be placed chiefly upon reports of severe infections as defined in Rule III. The difficulties in securing such reports might be less than in cases of contagious diseases, for no quarantine or placarding of domiciles would be necessary. The acquiescence of midwives could be secured by instituting yearly or periodic license, and this could be used to inspect their equipment and ability. The cooperation of physicians could be facilitated by the efforts of medical schools and societies. Few operations are now done in homes. As operative interference is directly or indirectly the most important factor in puerperal infection, mortality from this source would be less in homes than in hospitals. The moral effect of a system of maternal supervision would alone have considerable influence in home practice.

I have not dwelt upon the need of reducing puerperal infection. This is not one of the chief causes of death like tuberculosis, pneumonia, or cancer. It kills about as many as diphtheria and more than twice as many as scarlet fever or typhoid fever. It takes a toll of about 5,000 women a year, and these are the mothers, the most important members of the community. It also costs much illness and permanent disability. Its control is a great desire of the women of this country. It led to a crusade of the newly enfranchised women voters in 1920 for the passage of the Maternity and Infancy Welfare Act, the Sheppard-Towner Bill. It causes them to continue action to secure the passage of similar measures to replace that law that expired in 1929. It is the desire of every physician who has witnessed the grief and despair of families bereft of mothers lost unnecessarily.

2333 Cleveland Avenue.

ABSTRACT OF DISCUSSION

DR. E. D. PLASS, Iowa City, Ia.—There is no doubt of the need for improvement in obstetric mortality, but personally I doubt whether much can be accomplished under present conditions by any sort of government regulation. The Sheppard-Towner Act has elicited such widespread disapproval of the governmental interference with the practice of medicine that I am quite convinced that statutes of that sort, meeting such opposition as they do, can accomplish very little good. Certainly, the experience has been that obstetric conditions may be improved much more easily under a system of

hospital regulation, where the staff of the hospital interests itself in the character of obstetrics done and insists that consultation be called before any of the more serious obstetric procedures are carried out. Obviously such regulations are more applicable to the larger hospitals, whereas the situation is most serious in the smaller institutions. But even in the latter I doubt whether any sort of government regulation can in the present state of society be of much use; public opinion must be aroused.

There is, however, one phase of the problem which can be carried out without too great opposition. There is relatively little accurate information concerning the character of obstetric practice as a whole. We have statistics from the larger hospitals and cities but practically nothing from smaller communities, and we should have composite data. I have been attempting to get such figures from the State of Iowa by the inclusion in the regular birth certificate of a statement from the doctor regarding the character of the delivery. While these data have not yet been fully analyzed, some very interesting statistics have appeared. For example, among 40,000 births scattered throughout the State of Iowa, the cesarean incidence has been one per cent. There were 400 sections in the 40,000 deliveries. In the communities of over 10,000 population the hospital incidence of cesarean section was 3 per cent, while in the smaller community hospitals the cesarean incidence was 3.3 per cent. In home deliveries the incidence was 0.3 of 1 per cent. As Dr. Bacon has suggested, the hospital admission of patients leads the doctor generally to more interference than he would commonly undertake, and the relationship between interference and infection has been so thoroughly pointed out that it need not be discussed. In the 400 cesarean sections done there were 32 stillborn children; 8 per cent of the cesarean sections were done in the presence of still births, which indicates nothing wrong with the institution itself but rather with the training of the doctors who believe that cesarean section is a reasonable procedure for the delivery of dead children.

DR. JAMES K. QUIGLEY, Rochester, N. Y.—Dr. Bacon has given us something to think about. If the medical profession cannot or will not solve this problem, there is no question I believe, as to the authority of the State to attempt to regulate it. The program of maternal care as inaugurated under the Sheppard-Towner law, was not continued long enough to prove or disprove its value. To be sure, the emphasis was laid upon prenatal care but it at least was educational in pointing out the importance of good care at delivery. Of 946 women who received prenatal care in the State Clinics in New York in 1931 and were delivered, only one mother died and the cause was placenta previa and postpartum infection. Similarly in Westchester County of 1507 women attending prenatal clinics in the past seven years, there were only 4 fatalities, a rate of 26.8 per 10,000 or one-third the mortality rate of the entire district in 1931. Another feature of this work in New York State was a series of postgraduate lectures to County Medical Societies. These included the discussion not only of prenatal care, but the conduct of labor, normal and pathologic, with the emphasis placed upon conservative obstetrics. Here I think is a possible method of attack provided it were enlarged upon and continued.

I agree with Dr. Bacon that the embryo physician obtains his real impressions in clinical obstetrics more from his attending staff in his interneship than from his teachers in medical school and a great responsibility and obligation is that of the staff obstetrician. Not only by his teaching but by his example will he influence the younger man, and how can one expect to make conservative obstetricians of internes who daily see their teachers employ operative procedures with scant or no indications in a large percentage of private patients? Dr. Bacon's recommendation that the small general hospital accepting maternity cases and improperly caring for them should be prohibited from taking maternity cases until it has cleaned house and complied with rules, is a good one. The general hospital's responsibility in the present high mortality rate

has been overemphasized. There are many general hospitals with separate obstetric departments and staffs where as good work is done as in the special lying-in institutions.

Dr. Bacon has formulated a good working plan for hospital inspection, more far-reaching than that of the American College of Surgeons or the American Medical Association, where it seems to me an undue emphasis is placed upon maintenance of records and holding of staff meetings, to the neglect of an appraisal of the clinical work and its results in any institution.

I endorse emphatically every paragraph of Dr. Bacon's rules for the conduct of a maternity hospital and in addition would include a regulation that all nurses and internes be compelled to report any skin infection, no matter how trivial, and any acute illness such as coryza or sore throat before going on duty in the morning. There have been several epidemics of puerperal sepsis directly traceable to streptococcic sore throats.

DR. ARTHUR J. SKEEL, CLEVELAND, OHIO.—It was my privilege yesterday to show that large general hospitals can do good obstetric work. It seems to me that the trouble occurs largely in the small hospital where obstetrics is done only incidentally. It becomes desirable to do some obstetric work and the hospital allows its doctors to do this without giving any consideration as to how cases can be handled. It may be necessary to use the licensing power of the State to regulate the acceptance of such obstetric cases in the hospitals. It occurred to me that there might be some objection on the part of the medical profession to such control, and I think that whether this control should be made by the county, city, or state government, it would be well for the medical profession to keep their fingers on this control. This would do away with much of the fear of governmental regulation of medical practice.

DR. JAMES F. BALDWIN, COLUMBUS, OHIO.—Several years ago, at Grant Hospital, we thought there were altogether too many cesarean sections performed. The Obstetrical Staff, therefore, had a meeting and unanimously adopted a rule that no one should be permitted to perform a cesarean section, do a high forceps operation, a version, or induce labor, without consultation with one of four men, of whom I happen to be one. If one of the four has a case, he must consult with one of the others. This program has always worked beautifully, and with a marked diminution in the performance of these operations. We have felt that an obstetrician who is tired out with long attendance on a case, is not a good judge of the desirability of operative interference, but that a fresh man called into the case would exercise much better judgment.

DR. BACON (closing).—The possible objection of physicians to the establishment of a system of inspection, of course, has to be recognized. No health officer would undertake any measure of that kind without the support of the medical profession and I think the suggestion of Dr. Skeel is most valuable, that these inspectors should be nominated by the medical society. If the medical societies and the better element of the medical profession would cooperate with the health department in such inspection many of the difficulties that are anticipated would disappear. In regard to what Dr. Quigley said about the investigation of cases of death by the State, that is, of course, important but it is a little like locking the door after the horse is stolen. It may discover the horse, and it may discover how the stealing occurred, but it does not save the horse, in this case the mother. Therefore, the supervision that will prevent death is something that should be added. It is only with the cooperation of all of the elements of the community, the layman, the medical societies, and the state, that results can be accomplished. Medical teaching has not succeeded completely in the past and we must remember that the great majority of physicians graduated years before the better teaching was in vogue and their work needs special control.

A STUDY IN CORRELATION OF THE SEDIMENTATION TEST, FILAMENT-NONFILAMENT, AND THE WHITE CELL COUNT IN GYNECOLOGY*

H. Wellington Yates, M.D., David M. Davidow, M.D.,
Elizabeth Putnam, and Frances Ellman,
Detroit, Mich.

ANY movement to determine the infectiousness of a given case is quite worth while. Since we have so often been misled by the clinical findings as to the acuteness of disease, the profession at large has depended more and more on the white cell count; it is with this thought in view that we present the following:

The sedimentation test in gynecology has been the subject of considerable discussion during recent years with conflicting reports for and against its value in the diagnosis of pelvic conditions. Since a considerable amount of material was at our disposal, it was decided to carry on this test routinely on all cases admitted to the Gynecological Service at Receiving Hospital, Detroit, for a period of one year and to correlate the results on the patients operated upon for that period. During that time (1929 to 1930) very little or no attention was paid to the test as a diagnostic aid or as an aid in prognosis. It was our aim to settle definitely in the minds of our staff the value of the sedimentation test in gynecology. All the operated cases were reviewed at the end of 1930 and the sedimentation rates checked with the pathologic diagnoses and the average rates for the various conditions noted. This study had been undertaken previously two or three different times without any conclusive results. The reason for this was due apparently to the fact that inexperienced technicians, i. e., students and internes, carried on the work and the results were not at all uniform. During this particular study only experienced laboratory technicians have done the work and the technic has not varied, as a result the tests have been quite consistent with the clinical findings so that fairly definite conclusions could be drawn.

Since that probationary period of one year, the test has been used routinely and in order to bring it up to date, the operated cases for the past two years have been added to the first table. In addition, during the past few months, we have used routinely the filament-nonfilament count as developed in its simpler manner by Farley, St. Clair, and Reisinger, to check this new laboratory test with that of the sedimentation and white cell count. We hope to present here our findings in relation to these various tests and to determine which one is the most sensitive and valuable adjunct to the gynecologist's armamentarium.

---

*Read at the Forty-Fifth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, French Lick Springs, Ind., September 12, 13, and 14, 1932.

The settling out of the red blood cells from the serum is not a recently discovered phenomenon; Galen observed this reaction almost two thousand years ago. John Hunter also made this observation in the latter part of the Eighteenth Century, and he also described the variation in sedimentation rates in different species of animals. Various investigators from time to time reported the same observations, but did not correlate their results clinically. Fahraeus, in 1907, was the first to note the variation in sedimentation rate which occurred in pregnancy, infectious states, and in different periods of the same disease; his work was amplified by Linzenmeier who particularly placed the value of the test in the field of gynecology.

The exact biochemical changes which account for the variation in sedimentation rate of the red cells, are still unknown, but there are a number of theories advanced for this phenomenon. The most commonly accepted one is based upon the number of negative charges carried by the erythrocytes; as the negative charges are taken off, either by positively charged agglutinins present in the blood, or by the globulins whose presence increases the viscosity and decreases the negative charges, the red cells no longer repel each other and tend toward an increased rouleau formation. The more marked is this rouleau formation, the shorter is the time that it takes for the cells to settle out.

In our clinic, a definite routine was carried out for all patients. Every patient had a sedimentation test on admission in conjunction with other laboratory work. In addition all blood counts were accompanied by sedimentation tests which meant that all operated cases had this test twenty-four to forty-eight hours prior to operation. During the study of the filament-nonfilament count, this additional information has been added to the patient's record and the old type of differential count has often been dispensed with. The operative cases were chosen by the staff on the basis of the following requisites:

1. History.
2. Pelvic findings through bimanual and speculum examinations.
3. Absence of elevated temperature, except in cases of culdesac abscesses.
4. White blood cell count of 10,000 or less with a corresponding differential count, except in cases of pelvic abscesses.
5. Absence of complicating factors; such as kidney pathology, heart lesions, respiratory infections, etc., except where such complicating factors were compensated for and operative procedure indicated.

No attention was paid to the sedimentation rate for the first year, it being desired to continue the routine on the service, then later to check back and correlate the operative and pathologic findings with the sedimentation rate and clinical diagnosis. In this manner we sought to compare these various final diagnoses and sedimentation findings to determine the value of the relationship between the two. This first study embraced a series of 545 operative cases with a corresponding group of 1450

sedimentation tests. The operative procedure may be tabulated as follows:

A. Abdominal operations		377
1. Pelvic inflammatory disease	220	
2. Fibroids	101	
3. Miscellaneous laparotomies	30	
4. Appendectomies	19	
5. Ectopics	7	
B. Cervical operations		51
C. Perineal operations		40
D. Dilatation and curettage		52
E. Bartholinectomies		10
F. Colpotomies		7
G. Examination under anesthesia without operation		8

The revised group of cases which brings the series up to August 1 of this year and includes the first year's group upon which the results were first noted, may be listed as follows:

A. Abdominal operations	Total	1156
1. Pelvic inflammatory disease	633	
2. Fibroids	341	
3. Miscellaneous laparotomies	83	
4. Appendectomies	56	
5. Ectopic pregnancies	43	
B. Cervical operations		136
C. Perineal operations		115
D. Dilatation and curettage		216
E. Bartholinectomies		23
F. Colpotomies		83
G. Examination under anesthesia		44
	Total	1773

The total number of sedimentation rates during this three-year period is approximately 6,000.

The cases operated for pelvic inflammatory disease included all types and stages of salpingitis, with and without ovarian disease. The majority of these cases were varieties of chronic salpingitis with gross palpable pelvic pathology. A few cases of acute salpingitis were found at operation. It is never our custom to operate in acute cases, therefore, these may be classed as errors in diagnosis. In these few instances the sedimentation rate corresponded with the findings of acute infection.

In our clinic about 60 per cent of the cases came from the colored race and most of the fibromyomas were found in these people. As is true in other clinics, 80 to 85 per cent of these women also had pathologic adnexa, which frequently necessitated the removal of both ovaries, although ovarian tissue was conserved wherever possible. The fibroids showed 10 to 15 per cent of various degenerative changes, and depending upon the extent of degeneration, the sedimentation rate corresponded fairly well with the pathologic findings.

In the miscellaneous laparotomies which included ovarian cysts, exploratory, uterine suspensions, freeing of adhesions, etc., the majority of these cases were opened in addition to perineal work done preceding the laparotomy.

Appendectomies were done on cases mistakenly diagnosed as having adnexal disease.

The ectopic pregnancies revealed 31 ruptured with free blood in the abdominal cavity. Six were diagnosed clinically as tuboovarian abscess, although the sedimentation rate was higher than usually found in that type of pathology. There were 12 cases found to be old ruptured ectopics at the time of operation, this group included the 6 diagnosed as tuboovarian abscess.

The group of cervical operations included 24 advanced cases of cervical carcinoma, of which 7 were treated with radium. There were 12 cases of cervical polyp and the remainder consisted of various stages of cervicitis and endocervicitis, these were treated by cauterization, trachelorrhaphy, low amputation or Sturmdorf operation.

The perineal operations were for the most part anterior and posterior colporrhaphy and perineorrhaphy; there were also 11 patients who had a Watkins interposition operation and 5 patients who had extensive condylomata acumina removed by cautery.

Among curettages, there were 91 done for diagnostic purposes; 15 for polypoid endometritis, and 110 for retained secundines. The large number done for retained secundines is due to the fact that during the past eighteen months, only acute cases have been admitted to the hospital and the largest proportion of these cases have been incomplete abortions with bleeding.

There were 72 cases of frank culdesac abscesses diagnosed and operated upon as such. These were the only patients in the series who had elevated temperatures and white blood cell counts over 10,000. Eleven cases diagnosed as pelvic abscess had colpotomies done but instead of pus, 2 were found to be old ectopics, and 9 were cases of chronic salpingitis with large hydrosalpinx. In all these patients the sedimentation rate was over thirty minutes.

In 44 cases made ready for operation, when taken to the operating room for examination under anesthesia, where the clinical diagnosis was in doubt, were not operated upon because of lack of pelvic pathology. It was interesting to note that in every one of these cases the sedimentation rate was over sixty minutes.

The pathologic and clinical diagnoses of the cases operated upon quite often did not agree, and it was in these especially where a check up on the sedimentation rate which had been done before operation proved very illuminating. The average sedimentation rates as noted in the various types of pelvic pathology in this series are listed in a subsequent table. It is not to be understood that these figures are exact for each condition, nor are they intended to be pathognomonic. On the contrary they are only average figures and the margin of variation between the rates for the various pathologic types is not very exact. The sedimentation rate

is only an additional aid in the general picture when making a diagnosis and not a short cut or an easy method toward exactness.

We consider the sedimentation rate of two hours or over as normal. The average rates for the various conditions are as follows:

Culdesac abscesses	4 to 10 min.
Acute salpingitis	10 to 20 min.
Pyosalpingitis	10 to 20 min.
Subacute salpingitis	20 to 35 min.
Chronic salpingitis	35 to 60 min.
Healed salpingitis	60 min. plus
Fibroid uterus	59 min. plus
Appendicitis subacute and chronic	79 min. plus
Endocervicitis and cervicitis	100 min. plus
Ovarian cyst	122 min. plus
Retained secundines	41 min.
Advanced carcinoma	21 min.
Bartholinitis	90 min. plus
Ectopic pregnancy	40 to 50 min.
Cervical polyp	120 min. plus
Polypoid endometrium	83 min.
Perineal lacerations	120 min. plus
Normal	120 min. plus

It has been interesting to note in our series that in cases of incomplete abortion with definite anemia, the sedimentation rate is more rapid than normal and this finding corresponds with that of other observers. This anemic condition may also explain the lowered sedimentation rate in ruptured ectopic pregnancies.

Of the 1773 cases studied, 1620 showed a definite correlation between the pathologic diagnosis and sedimentation rate. This would give the test an approximate accuracy of about 91.4 per cent. We believe that these figures compare favorably with any laboratory test at our disposal. As compared to this, 1202 cases showed a definite correlation between the white blood count and pathologic diagnosis; this means a percentage of 67.8 per cent accuracy as compared with the sedimentation rate of 91.4 per cent.

There is another laboratory procedure which has attracted considerable attention during the past two or three years which promises, according to some investigators, to surpass the sedimentation test in usefulness. This is known as the filament-nonfilament differential blood count.

Arneth, in 1904, was the first to demonstrate the clinical significance of the various forms of nuclei in the polymorphonuclear neutrophils during various types of infections. He separated these neutrophils into five classes, depending upon the segmentation of their nuclei. In Class 1 he placed the cells with slightly dented nucleus. This made up about 5 per cent of the total in normal individuals. Class 2 cells had two lobules to the nucleus, and comprised 35 per cent of the total. Class 3 had three lobules and totaled 41 per cent; Class 4 made up 17 per cent of the total and had four lobules, while Class 5, which made up the balance of 2 per cent had five or more segmentations. The number of segmentations determined the age of the cell; the greater the number of segmentations, the older the cell. His work, while very complete, proved too complicated for ordinary routine differential counts, but it laid the foundation for the investigation which followed. He proved that an increase in the number of immature cells

represented the response of the myeloid tissue to the stimulation of any infectious agent, and this he termed "the shift to the left." As the infection subsided, the number of immature cells returned to normal and this phenomenon he termed "the shift to the right."

Since Arneth's work, there have been efforts made to simplify the number of classes; to make the test more applicable to clinical use. Schilling, in 1920, published a modification of Arneth's grouping, and placed more emphasis on the change in the staining characteristic of the granules as a result of toxic stimulation and change in size of the cytoplasmic granules.

In 1924, Pour and Krumboor contributed another plan of differentiation in order to simplify former methods. In 1927, Cook and Ponder made valuable contributions to this study of neutrophils. Finally, in 1930, Farley, St. Clair, and Reisinger developed what seems to be a very simple method. They regrouped the five classes of Cook and Ponder into two classes; the first being the same as Class 1 and the second including the other four classes; they termed the first class as "nonfilament" and the second group as "filaments."

Farley, et al., adopted as normal a nonfilament count of 8 to 16 per cent and this is practically agreed to by other observers. The normal of small lymphocytes was placed at 25 to 30 per cent.

Weiss pointed out that during infections every cellular system of the body is called into action. The bone marrow which supplies the polymorphonuclear neutrophils responds first; and depending upon the severity of the infection, depends the number of nonfilament cells which the marrow contributes. In very acute and severe infections the number of nonfilament cells may be markedly increased. During this time, the eosinophils are usually absent, as are the monocytes, and the lymphocytes have decreased at times to 10 per cent. When the infection subsides the reticuloendothelial system comes into action to replace the neutrophilic stage. The nonfilament cells decrease and there is a definite increase in monocytes with increased numbers of lymphocytes as the lymphatic system becomes active. Thus one should be able to determine and visualize the course of an infection by repeated counts of this type and prognosis could be gauged by the increase or decrease of lymphocytes.

We became interested in this test because of some work done by Reveno and Berent of Detroit and since May, 1932 have been using it routinely on our service. Herein are grouped 538 cases which fall into the following classifications:

Infections	232
Abortions	167
Miscellaneous	96
Residual	43
Total	538

In the tabulation of the subheadings of these groups, the average blood count and sedimentation rate, in addition to the filament-nonfilament count has been recorded. The percentage of accuracy has been determined by comparing the three laboratory methods with the pathologic and clinical diagnoses and actually enumerating the number of cases wherein there seems to be no connection between laboratory test and diagnosis.

COMMENTS

There was a definite correlation of sedimentation rate and filament-nonfilament count in the cases of infection. This was especially true in the

acute and subacute cases where the tests fairly paralleled each other. The cases of acute exacerbation showed that the sedimentation rate was more accurate in demonstrating the infection than was the filament-nonfilament count. The same situation was found in the study of the pelvic abscesses.

I. INFECTIONS

	CASES	SEDIMENTATION	FILAMENT	NONFILAMENT	BLOOD COUNT
Acute salpingitis	59	10-20	36-69	10-58	17,000
Subacute salpingitis	28	20-35	40-70	15-32	11,000
Chronic salpingitis	40	35-60	50-70	10-26	9,800
Acute exacerbations	42	12-25	50-78	8-22	12,500
Pelvic abscess	14	6-14	34-65	10-34	16,000
Tuboovarian abscess	26	7-20	44-71	10-38	13,000
Hydrosalpinx	9	8-120	52-66	3-12	7,200
Fibroid and pelvic cellulitis	14	20-48	44-70	4-26	7,800

II. MISCELLANEOUS

	CASES	SEDIMENTATION	FILAMENT	NONFILAMENT	BLOOD COUNT
Fibroids	34	45-120	40-74	6-20	8,100
Ectopics	16	22-72	43-71	5-24	9,200
Bartholin abscess	4	20-25	50-60	12-16	6,400
Twisted ovarian cyst	3	26	55-57	22-23	11,400
Appendicitis	6	77-90	44-54	10-28	7,550
Uterine polyps with infection	7	13-22	53-64	10-30	12,600
Pregnancy	6	60-90	58-62	4-14	6,800
Perineal cases	14	80-120	54-70	5-15	8,000
Carcinoma of cervix	6	22-30	49-55	11-35	10,500

III. ABORTIONS

	CASES	SEDIMENTATION	FILAMENT	NONFILAMENT	BLOOD COUNT
Abortion	83	21-120	38-70	4-54	5,000-19,600
Septic abortion	34	7-31	45-60	10-45	18,600
Abortion with anemia	36	19-48	43-70	14-36	13,500
Threatened abortion	14	34-120	46-75	9-16	8,750

IV. RESIDUAL CASES

	CASES	SEDIMENTATION	FILAMENT	NONFILAMENT	BLOOD COUNT
Cyst of Gaertner's duct	1	120	66	14	4,800
Pyelitis	4	30-60	48-64	14-28	15,400
Meningitis	1	32	50	31	22,100
Ulcer of vagina	1	21	48	32	15,800
Rectovaginal fistula	3	22-40	40-53	7-16	8,500
Subinvoluted uterus	2	60 plus	64	12	7,600
Ovarian cysts	2	90	56	10	6,100
Fibroid with pregnancy	1	60	54	12	7,300
No pathology	28	60-120	49-71	5-16	7,450

The white blood count varied considerably and was quite frequently not in accord with the pathologic and clinical diagnosis. The filament-nonfilament count apparently varied as to the severity of the infection present, and it was noted that patients with poor resistance had low nonfilament counts. This may account for the relatively low nonfilament count in the protracted cases of culdesac abscess.

The total of nonfilament cells returned to normal more rapidly than the sedimentation rate did after operation or subsidence of the infection and in this way proved to be a very definite aid in prognosis of the case, whereas the sedimentation rate took a longer time in showing improvement of the patient's condition and could not be used for prognostication.

As previously noted, purely from a diagnostic point of view, the sedimentation rate showed an accuracy of 91.4 per cent. The white blood count had an accuracy of 67.8 per cent and of the 538 cases tabulated, 415 demonstrated the accuracy of the filament-nonfilament count, a percentage of 77.2.

The miscellaneous groups again brought out the definite correlation between the sedimentation rate and filament-nonfilament count. Here, too, the white cell count is shown to be a negligible factor. The lowered sedimentation rate in the ectopic pregnancies may be due to the anemia resulting from hemorrhage within the abdomen, for the lowest rates were found in the cases with the greatest hemorrhage. The sedimentation test was rapid in cases of Bartholin abscesses, while the filament-nonfilament count, for some unknown reason, was normal. In cases of appendicitis, the reverse situation was true. These are findings for which we could find no definite explanation. All the cases of uterine polyps were infected as were the cervical carcinomas and showed the proper response on the part of the two tests.

In the group of abortions occurred the most bizarre white blood counts, sedimentation rates, and filament counts. The cases of septic abortion showed rapid sedimentation and increased nonfilament cells as did the severe anemias following abortions. The cases of abortion, both complete and incomplete, without infection had no correlation whatever between the tests or with the condition present. This may be due to the fact that the sudden change in the blood picture brought about by rapid loss of blood, threw the hemopoietic system into such marked activity that all the blood forming tissues were throwing cells into the blood stream. The same condition existed in cases of threatened abortion with acute onset of bleeding which later stopped and where expulsion of fetal structures did not occur.

The group of residual cases is self-explanatory and corresponds with the findings previously noted.

Our conclusions are as follows:

1. (A) The percentage of accuracy of white blood count in these two studies was 67.8 per cent. (B) That of the filament-nonfilament count was

77.2 per cent. (C) The accuracy of the sedimentation rate was 91.4 per cent.

2. There was a definite correlation of the sedimentation rate and filament-nonfilament count in the infectious conditions.

3. The white blood count was not dependable.

4. In our cases of marked anemia the sedimentation rate was more rapid than normal.

5. In the cases of abortion with bleeding there was no correlation between the three tests.

1551 WOODWARD AVENUE.

ABSTRACT OF DISCUSSION

DR. HARRY R. HUSTON, DAYTON, OHIO.—During the past two years we have conducted an investigation at the Miami Valley Hospital for the purpose of determining the value of the erythrocyte sedimentation test and the modified Schilling filament-nonfilament polymorphonuclear leucocyte count in surgical diseases. We have found a combination of these two simple laboratory procedures to be of the greatest possible diagnostic and prognostic value, when intelligently combined with the clinical signs and symptoms. The technic of the tests is exceedingly simple and is not time-consuming.

We have found the test to be of particular importance in pelvic inflammatory disease and in acute suppurative abdominal conditions. The filament-nonfilament leucocyte count provides an accurate index of the response of the myelopoietic system to existing inflammation or hemorrhage. The degree of myelopoietic response conforms to the severity of the stimulus, as measured by the appearance of increased numbers of immature polymorphonuclear leucocytes in the peripheral blood stream. In many instances the ordinary white blood cell count, which does not distinguish between mature and immature polymorphonuclear neutrophils, not only fails to yield the desired information, but not infrequently leads to diagnostic confusion. This is particularly true in acute suppurative abdominal disease, in which the total white blood cell count falls within the normal limits or shows but a slight increase. In such cases also the total percentage of polymorphonuclear leucocytes may not be appreciably increased. If it is found, however, that the percentage of immature nonfilament polymorphonuclear neutrophils is appreciably increased, this single additional observation assumes the greatest possible importance. In many instances, we have encountered cases of acute appendicitis in which neither the clinical signs nor the ordinary white blood cell count provided convincing diagnostic evidence, but in which the percentage of immature polymorphonuclear leucocytes was well above the normal level. This finding is of particular importance if repeated blood counts are carried out and the number of immature cells shows a progressive increase. Such evidence indicates that suppuration is present.

In the differential diagnosis of uncomplicated benign pelvic neoplasms and pelvic inflammatory disease the information provided by these tests has been invariably conclusive in our experience.

DR. LAWRENCE M. RANDALL, ROCHESTER, MINN.—Dr. Yates' paper serves to emphasize further the importance of the correlation between the clinical and laboratory data. This is brought out in the paper by the statement that 91 per cent of his sedimentation tests were accurate when the history and clinical findings were taken into consideration. If one employs this test as a short-cut to diagnosis it is likely to get us into trouble.

It has been pointed out by Westergren that the sedimentation test is really a test of the sedimentation reaction of the individual; that it is nonspecific and is not necessarily a help to us in localizing the disease process. We have felt that the sedimenta-

tion reaction in conjunction with the other data obtainable concerning the patient will allow us to make a final diagnosis in the first place, and in the second place, after the reaction is determined repeatedly on the same patient, it permits us to judge results in treatment and to aid in determining the time for operative interference.

DR. ALBERT MATHIEU, PORTLAND, OREGON.—After a consideration of between eighteen and twenty thousand estimations of the rate of sedimentation of red blood cells, we have arrived at the following conclusions:

1. The sedimentation rate is increased in the blood of patients who have in their bodies conditions of acute inflammation, marked cellular proliferation, or hemorrhage under pressure.

2. Lobar pneumonia and acute miliary tuberculosis give the highest rates followed closely by acute gonorrheal salpingitis.

3. Infection is not necessary to a rapid rate as carcinoma and pregnancy both cause it to be increased.

4. A routine red cell sedimentation rate in conjunction with every physical examination will repay the gynecologist or obstetrician who of necessity is not as complete in his general examination as the internist. Often the sedimentation rate will be increased without any explainable cause and this increase in rate is the warning that some hidden trouble must be sought. In our experience, the sedimentation rate has been of far more value than the leucocyte count because at times even though there was no leucocytosis and the patient's complaints were more or less vague, the sedimentation rate acted as an unmistakable sign that we were overlooking something.

One such instance I will mention as an illustration, giving only the barest details. A woman three months pregnant, normal in every way as far as could be determined and with absolutely no complaint except pregnancy, gave an extremely rapid sedimentation rate: 50/96. Her urine and leucocyte counts were constantly negative and normal respectively but repeated sedimentation rates were increasingly rapid. After search and study a pyelonephritis with nephrolithiasis was found. Had it not been for attention to the sedimentation rate this would have been missed because it presented absolutely no symptoms.

DR. FREDERICK H. FALLS, CHICAGO, ILL.—We have been studying the sedimentation test at the University of Illinois from a different angle. We did careful tests on a series of 208 gynecologic cases of various types. We then prepared these patients for operation according to the usual method of observing the clinical condition of the patient. When the temperature remained normal for a week or ten days and the leucocyte count was below 10,000, we operated whether or not operation was contraindicated according to the sedimentation test. After operation we checked the sedimentation rate against the number of hospital days and postoperative morbidity and mortality. There was no appreciable difference in these respects between cases with high or low sedimentation rates. We feel therefore that a great deal of time will be saved to the patient if a rapid sedimentation rate be disregarded when it does not agree with the clinical findings.

DR. YATES, (Closing).—All I wish to say in conclusion is that from our experience of 1700 cases the sedimentation time and nonfilament estimation are of very definite prognostic and diagnostic significance, and we have become more and more skeptical about the simple, old fashioned white blood count. As I said in the paper, this is not a short-cut to diagnosis, but it is a distinct aid in the study of infectious processes and a prognostic guide. I do not wish to put this as an ultimatum in the way of determining our position in a given case but, with Dr. Falls, I certainly agree that as clinicians we must think clinically of a patient irrespective of any type of instruments of precision or laboratory findings. We find more and more as we study our clinical symptoms that after all the basis of our activity should be determined by them.

THE RELATIONSHIP BETWEEN EXOGENOUS THROAT STREPTOCOCCI AND PUERPERAL INFECTIONS*

FOSTER S. KELLOGG, M.D., AND ARTHUR T. HERTIG, M.D.,
BOSTON, MASS.

(From Departments of Obstetrics and Pathology, Harvard Medical School)

DURING the "respiratory season" in 1911-1912, a very severe and disastrous epidemic of puerperal sepsis occurred in a hospital in Boston. The most striking single fact of this epidemic was that a certain number of the cases, fatal as well as nonfatal, and regardless of whether examined at or near delivery, occurred late in the puerperium. Some were as late as the ninth, tenth, and eleventh day, while occasional patients were up and ready for discharge. This epidemic was competently written up and was considered to be primarily throat borne. Permission to publish was withheld because, one presumes, of undesired publicity. That such was the case seems in retrospect a great pity and a great responsibility as one contemplates the possible educational results of such a published study toward the reduction of puerperal mortality in the past twenty years.

In contrast, in 1927 when a serious outbreak of puerperal infection took place at the Sloane Hospital in New York, Meleny and Stevens made a careful investigation, with the result that they "failed to reveal any probable cause except air contamination (i. e. contact contamination through the air, by nasopharyngeal droplets) by carriers among the medical and nursing personnel and as a result they recommended the wearing of masks by all who enter the delivery room in hospitals."

To show that this final sentence is right as far as it goes but does not go as far as it should is the purpose of this paper.

On the evening of December 17, 1931, one of us (F. S. K.) was asked to see a patient in consultation in a well-equipped general hospital with a small maternity wing. An epidemic of puerperal sepsis was found; one patient had died the day before and one was dying. Of ten women consecutively delivered from November 19, 1931, to December 7, 1931, nine ran febrile temperatures to a greater or less extent in the puerperium. Two of these died and positive cultures of hemolytic streptococci were obtained from the blood stream and uterine cavity. Without reiterating what may be readily seen on the charts, four facts are noteworthy: (1) On the whole the temperature rises are later than one expects in infection at delivery. (2) Several different men delivered the patients. (3) The symptoms were largely peritoneal. (4) The prostration was on the whole out of proportion to the elevations shown.

*Read at the Forty-fifth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, French Lick Springs, Ind., September 12, 13, and 14, 1932.

Having seen the patient in question in consultation (No. 7) and given a good prognosis on the basis that she seemed to be localizing in the left vault, we discussed the situation. It was agreed to keep the ward shut which had been closed since December 5, send such patients to their homes as would probably not need transfusion or surgery, and place such patients as remained in a large available open ward with the windows open and shut off from the rest of the hospital. A guess was made that diligent search would reveal a throat carrier.

Much admiration for the honest manner in which the staff was meeting its responsibilities has increased with their readiness to permit this report. It is more impressive in contrast to previous experience.

Two days later information was forwarded that a culture of hemolytic streptococci had been obtained from the throat of a nurse in contact with all the patients.

Excerpts from a final letter from the physician in charge show the chronological relationship of this contact and are here quoted. "The nurse was on duty at night in the maternity ward. Due to the fact that it is a small unit there is only one nurse on at night except when deliveries occur. Therefore she came in contact with every patient in the ward except two that had specials. This nurse was complaining of sore throat and slight malaise about November 25. This nurse was admitted sick to the medical service November 27 and was off duty for three days coming back on the thirtieth. Her throat was cultured but unfortunately through some oversight the report came back 'Negative for diphtheria.' She was most unfortunately sent back to the maternity ward."

Briefly summarized in the letter the course and end-results were as follows:

5 Patients had a rather mild course and went home well.
2 Patients died.
1 Patient sent home with temperature, bled, returned, transfused, well.
1 Patient ran a septic temperature for a long time, was sent home and an abscess opened over Poupart's ligament on left. Is well now.
1 Patient ran a septic course, went home after six days of normal temperature on December 25, 1931. She remained temperature free until March 25, 1932, and at that time was running a temperature of 102°-103° F. with intestinal symptoms, whether due to the old infection or to grippe was not then determined. This patient recovered after six weeks without definite diagnosis.

Thus we have in this small epidemic a 90 per cent morbidity, half mild, half severe, and a death rate of about 20 per cent.

The letter continues, "As I told you the idea of streptococcus did not enter my head until after closing the ward. On December 7, before any of the patients had become dangerously sick, Mrs. Z. developed a scarlet rash. She had had scarlet fever a few years before. On this day the local board of health was called in but agreed with a diagnosis of grippe and offered nothing in the way of help.

"There were two blood cultures positive for hemolytic streptococcus and a similar organism was obtained from the inside of each of these patients' uterus. Both died. The throat cultures were several times negative on all the patients that had the

disease, including the two that died. About December 15 the State Board of Health was called in. Cultures were made from the air with Petri dishes which were negative, and throat cultures from the nurses, doctors, attendants, etc., were taken. All were negative except this one night nurse. They were negative three days later."

So is rounded out a clear cut picture showing possible results of throat borne hemolytic streptococci to parturient women in a well regulated hospital. It demonstrates that hospital sepsis is not a thing of the past entirely, and that our technic for the protection of our patients needs improvement.

The explanation of the source of this catastrophe is clinically satisfactory, but from a bacteriologic point of view leaves something to be desired. We are able to supply this additional data in part from another experience occurring within three months of the above, in an institution for which one of us (F. S. K.) is responsible. It was checked by complete bacteriologic studies by one of us (A. T. H.) in a precisely similar single instance occurring in still another hospital at about this time.

Our second experience came from two patients delivered at the Florence Crittenton Hospital in Boston.

A summary of these cases is as follows:

CASE 1.—Primipara. Low Forceps. Death on the tenth day, postpartum after late transfer to Boston City Hospital and "Terminal transfusion."

Diagnosis: Streptococcus septicemia (puerperal). Probable peritonitis.

CASE 2.—Primipara. Face presentation, internal podalic version. Recovery on fifty-seventh day, postpartum after early transfer to Boston Lying-In Hospital (sixty hours) and early repeated transfusion.

Diagnosis: Streptococcus septicemia (puerperal).

Knowledge of the death of the first patient came to the chief of the Florence Crittenton staff through accidental information from a member of the City Hospital surgical staff. This fact goes to show that even now the potential seriousness of a single case of puerperal sepsis to other patients in an institution supposed to be "well regulated" is not appreciated by otherwise well trained doctors and nurses. Early the following morning at the hospital it was rather casually mentioned that "another patient had a temperature" the night before. This patient had a temperature of 104° and a pulse of 130 in the morning and was the picture of a full-blown puerperal streptococcus sepsis. Immediately permission was asked and granted to transfer the patient to the Boston Lying-In Hospital. This transfer was immediately made. At the risk of seeming trite such a transfer accomplishes the following objects: (1) It rids the small institution with its untrained pupil nurses and poor isolation facilities of a menace to the other patients. (2) It puts the patient into an institution where proper isolation facilities and nursing personnel (i. e. septic floor both ward and single rooms with special nurses) are safeguards to the rest of the institution. (3) It places the patient in a position to have constant medical attention, bacteriologic study, and high grade nursing. In this connection we believe that, aside from good nurs-

ing, fresh air, and assured rest (a matter of supreme importance, often neglected), frequent transfusion, checked by red counts every other day, is our only therapeutic measure. We further believe that such transfusions should be begun very early in the disease and not used as a late or last resort. This implies available donors in quantity and a large medical personnel since double team transfusion is highly desirable in the interests of these donors. For example it is clear in retrospect at least, that Case 1 should have been transferred and transfused long before she was. The fact that transfer "within the hour" of the second patient appeared to surprise the personnel at the institution, emphasizes that the subject is a blind spot to too many persons otherwise well trained in maternity care. Had the first patient been transferred early and a proper investigation undertaken it is unlikely that we would have had a Case 2, while in the light of the outcome of the second case it is possible the first might have recovered. Until the significance of this is grasped by all connected with maternity care, unnecessary deaths will take place periodically.

Following the transfer of Case 2 a brief survey of the Florence Crittenton Home was undertaken by one of us (A. T. H.) in an attempt to uncover any factors which may have had an epidemiologic bearing on the septic outbreak. At no time were there any demonstrable contacts between either patient except in the prenatal wards where both spent some time prior to delivery. During this period neither showed symptoms of any sort. During the four days after delivery, the first patient occupied a bed in the eight bed postpartum ward. On the third day she had an elevation of temperature up to 103.6°. She then remained isolated for five days in a single room. At the end of this period she was sent to a large general hospital where she died twenty-four hours later, or ten days after delivery, of septicemia and probably generalized peritonitis. No autopsy was done but a pure culture of alpha prime hemolytic streptococcus (so reported by the bacteriologist) was isolated from the blood stream prior to death. Unfortunately this strain was not obtainable at the time this investigation was undertaken.

Both patients were delivered by the same personnel, including the visiting obstetrician, house officer, supervisor, and nurses. Only the operators were masked during the delivery. A feature of interest was the fact that both patients occupied the same bed in the postpartum ward, although they were delivered eleven days apart. During the last seven days of this period the bed was empty and was aired on the sun porch together with the mattress and blankets. All bedding, with the exception of the latter articles, was sterilized. It is doubtful if hemolytic streptococci could have remained viable under those conditions either on the bed or in the bedding. Granting that there might have been some etiologic relationship between the first and second case, the former has yet to be explained.

The second patient, after experiencing a chill with elevation of temperature on the second day, was sent to the Boston Lying-In Hospital where she ran a septic course for many weeks but finally recovered. During her stay, hemolytic streptococci of a type similar morphologically to those isolated from the first patient were isolated from her lochia and blood stream.

Because of the lack of demonstrable etiologic factor in either case, throat cultures were taken from all persons who had been in contact with either patient. These included the visiting obstetrician, house officer, the supervisor, and seven duty nurses. All cultures were negative for hemolytic streptococci except those from two nurses which were strongly positive. Each yielded a culturally different strain of hemolytic streptococcus. That from the night nurse possessed a relatively large clear colony with a faint but distinct zone of hemolysis (as did the two strains from the patients), while the other strain was of the usual beta type with small, clear colonies, and a wide, prominent zone of hemolysis. Both strains in broth were similar morphologically, possessing chains averaging eight to twelve organisms in length. It is interesting to note that from both patients culturally similar strains of hemolytic streptococci were obtained which corresponded to the type isolated from the throat of the night nurse. Incidentally the latter was suffering from symptoms of a mild upper respiratory infection during the septic outbreak. Rabbits were immunized by injection of these strains in an attempt to determine by cross agglutination what, if any, relationship there existed between the throat organisms and the one isolated from the second patient. The latter strain continually killed rabbits so that no immune serum was obtained for typing.

Regardless of the fact that a positive etiologic relationship between one or the other of the throat strains and the second case of puerperal sepsis was not proved, such a relationship has been definitely established in one case coming within the experience of one of us (A. T. H.). The patient, a para ii, delivered in a private hospital by an easy Scanzoni maneuver ran a perfectly normal postpartum course for the first seventy-two hours. At this time she had a chill followed by elevation of temperature and evidence of a spreading peritonitis. A pure culture of hemolytic streptococcus was isolated from the lochia on the fourth day, and from the peritoneal cavity, at autopsy, on the seventh postpartum day. Cultures were made from the throats of all persons coming in contact with this patient, in addition to one from the throat of the patient herself. The only positive culture obtained was from the throat of the patient's own private nurse. Subsequent typing of Dr. J. H. Mueller of the Department of Bacteriology at the Harvard Medical School showed the patient's strain to be apparently identical with that isolated from the throat of the nurse.

On transfer of patient 2 the following standing orders for personnel

were immediately posted, put into effect and the superintendent made responsible for their maintenance.

RULES FOR NURSES AT THE FLORENCE CRITTENTON HOSPITAL

1. Graduate and pupil nurses shall be masked and capped at all times when in contact with patients as long as the patient is on the hospital floor.

2. Failure of a nurse to report a cold or sore throat to the head nurse shall be followed by summary dismissal without credit if discovered.

RULE TO HEAD NURSE REGARDING SORE THROATS AND COLDS

Absolute masking must be insisted upon, and breakers of this rule punished.

A loose mask around the neck is no protection.

On receiving a report from a nurse that she has a sore throat or cold, the nurse shall be isolated in her own room and four hour temperatures taken, by the head nurse or acting head nurse, herself masked. The head nurse or acting head nurse shall then scrub as for an operation, after each contact. The person servicing the nurse shall not be a pregnant inmate and shall not service pregnant or delivered inmates, unless she is a graduate nurse in which case she must "Scrub up" ten clock minutes after each contact. This event should be reported to the superintendent or the acting superintendent who will make provision for cultures to be taken. The nurse shall not be allowed out of her room until permission is granted in each instance by the chief of staff after consultation with the superintendent and report of cultures has been obtained.

It is expected that the head nurse will apply this rule to herself as well. The infected nurse shall be allowed back at work in the hospital again only with the specific permission of the chief of staff.

No perineal ice bags shall be used under any circumstances in the Florence Crittenton Hospital.

RULE FOR RESIDENT AT THE FLORENCE CRITTENTON HOSPITAL

He shall report all temperatures of 100° or over to the staff man, who is supposed to see such patients within six hours. If the staff man does not respond within this time he shall report the temperature to the chief of staff.

He shall be masked and capped during all contact with patients before, during and after labor.

It seems reasonable to draw the following conclusions from the above:

1. That nasopharyngeal carriers of hemolytic streptococci (and perhaps other organisms) are a most dangerous source of frequently fatal sepsis to women in childbirth from the moment labor begins (and possibly before) to the end of the puerperium (at present an unassignable date but at least fourteen days after delivery).

2. That "silent carriers" are potentially as dangerous as persons acutely sick with temperatures, save for less likelihood of coughing or sneezing, although usually a history of some acute exacerbation in the not distant past may be obtained from the carrier.

3. That perineal contacts are presumably the most frequent method of transmission; either by coughing, sneezing, or talking with the patient during perineal precautions or by incomplete manual asepsis after self infection of the hands by the carrier, as by the use of a handkerchief; but that for the present other less direct methods must be assumed, and guarded against.

4. Hence that every carrier is a source of danger and must be eliminated or be masked adequately at all stages of labor and the puerperium and be absolutely trained and trustworthy about digital asepsis.

5. That since pupil nurses are untrained and unhabited to conscientious digital asepsis, it is a wise precaution to culture each one on entrance to a maternity hospital and to eliminate each one temporarily until the throat is negative for hemolytic streptococci.

6. That other personnel, i. e., doctors and graduate nurses trained in asepsis, following rules akin to those given above, will in all probability not prove a hazard to patients.

7. That the question of ward attendants, especially those serving food must be carefully considered.

8. That a single case of puerperal sepsis in an institution calls for immediate rigid investigation and drastic measures based on this to limit spread.

We wish to express our gratitude to the unnamed collaborators in this paper without whose cooperation and sanction it could not have been written or published.

19 Bay State Road.

ABSTRACT OF DISCUSSION

DR. EDWARD SPEIDEL, Louisville, Ky.—With all the precautions mentioned in protecting our patients from this kind of infection we lose sight of the greatest menace of all, the visiting public that enters the hospital. Unless we have an opportunity to limit this nuisance of excessive visiting in hospitals, especially in maternity hospitals, I fear that all of the precautions mentioned in the paper will be nullified.

There is another item that should be considered. Fever may occur in patients where the delivery was conducted without any examination, or in such manner that infection could not have been introduced. In many of those cases the patient probably had a gonorrhea in the cervix and in the course of the puerperium these organisms became very virulent and caused elevation of temperature.

DR. BETHEL SOLOMONS, Dublin, Ireland.—In our institution we are not wearing masks and are not having trouble. I have taken some series of throat swabs when there were no infections and got exactly the same results as when there were infections. You may say, but why not take that little extra precaution and wear masks? I have been in hospitals in various places where masks were worn, the masks being sucked in and covered with saliva. Lachlan Grant, medical officer of health in Argyle, Scotland, has written a very fine paper, condemning masks on account of the moisture that collects.

DR. KELLOGG (closing).—Regarding masks, there is no question that the present mask in use is inadequate and we are working, as some others are, to get a more satisfactory mask. Sepsis is a relative thing anyway. If a mask is worn in a laparotomy, and I take it most people do this, it seems rather queer not to mask over an open wound in a perineum.

In discussion of almost any obstetric problem, there always arises in my mind a suspicion that local conditions in different places vary. Now the hemolytic streptococcus of Dublin and that of Boston may be qualitatively or quantitatively different. When, for example, we reported 25 per cent mortality in eclampsia, and others say that they would be glad to come to Boston and teach us how to lower our mortality, we begin to suspect that the type of eclampsia may differ in different regions. We do have in New England an extremely virulent and a very pernicious hemolytic streptococcus each season, which appears to cause a good many clean cases each year to end fatally.

INJURY TO URETERS INCLUDING ACCIDENTAL LIGATION DURING PELVIC OPERATIONS*

QUITMAN U. NEWELL, M.D., F.A.C.S., ST. LOUIS, MO.

(From the Department of Obstetrics and Gynecology, Washington University Medical School and Barnes Hospital)

I WAS prompted to make a study of this subject, because recently I performed a complete abdominal hysterectomy for carcinoma of the fundus uteri, and thirty-six hours after operation, the patient died from an acute dilatation of the heart. The autopsy showed, in addition to the heart condition, that I had ligated the left ureter about 5 cm. from the bladder. The right ureter was in normal condition, although the patient did not pass any urine following the operation. I desire to report the history of the patient in question, also other cases in which the ureters were either ligated or injured during pelvic operations in the Gynecological Service of Barnes Hospital, from Jan. 1, 1915, to July 1, 1932.

From Jan. 1, 1915, to July 1, 1932, in the Gynecological Service of Barnes Hospital, 1784 hysterectomies were performed for various reasons. Of this number 519 were complete abdominal hysterectomies, 63 were complete vaginal hysterectomies and 1202 were abdominal supravaginal hysterectomies. During the course of these operations, one or both ureter were knowingly injured by clamping, cutting, tying or interfering with the circulation in some manner in eight cases. This is an unusually small number of injuries as compared to the number of hysterectomies performed. I am sure one ureter is occasionally ligated and the condition is unrecognized and the kidney on the corresponding side dies before the ligature around the ureter is absorbed.

During the postoperative course, there are no definite symptoms to show that only one kidney is functionating. Of course, if both ureters are ligated, the patient has an anuria and by cystoscopic examination the diagnosis is easily established.

Most gynecologists regard operative injury of the ureter as exceptional and nearly all are in accord in believing unilateral injury fairly common and bilateral injury exceedingly rare. They describe ureteral injury as the most common accident in pelvic work.

CASE REPORTS

CASE 1.—Mrs. A. P. R., aged sixty-seven years. Hospital No. 22954. Admitted Dec. 26, 1929, for vaginal bleeding. A very large obese patient weighing 198 pounds, with a chronic myocarditis and hypertension of 176 over 98. She presented a carcinoma of fundus uteri. A medical consultant classified her a fair operative risk. An abdominal operation was considered the treatment of choice. This was preceded by

*Read at the Forty-fifth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, French Lick Springs, Ind., September 12, 13, and 14, 1932.

diagnostic dilatation and curettage, and the laboratory reported adenocarcinoma of the fundus uteri. On Jan. 4, 1930, at time of laparotomy, it was noted that patient had two uteri and two cervices. This was not diagnosed before operation as the cervix on the right side had not been seen during speculum examination. However, a lot of scar tissue was found extending the entire length of the anterior vaginal wall. Probably the result of extensive vaginal lacerations during childbirth. A small mass was palpable in the right side of pelvis in apposition to a normal uterus which was felt in a forward position. The mass was thought to be a prolapsed adnexa or some parametrial infiltration. There was a band of peritoneum extending forward from the sigmoid to the central part of the top of the bladder. It was ligated and severed. The two uteri were fully developed, the one on the left side was slightly larger than the one on the right. They were attached to each other at about the internal os and continued into the vagina. Attached to each fundus was one tube and one ovary. Complete hysterectomy with removal of both tubes and both ovaries were performed in the usual manner. All the clamped pedicles were ligated, the tuboovarian and upper broad ligament pedicles were ligated before the uteri were removed. There was insufficient bladder peritoneum to cover the ligated pedicles so some raw surfaces were left exposed. At no time during the operation were the ureters visible. The appendix was not removed. Abdomen closed in routine manner and retention catheter placed in position. The operation was fairly difficult due to excessive fat in the pelvis.

Postoperative Course.—Patient returned to ward in fair condition and immediately was given 1500 c.c. normal saline solution subcutaneously and 500 c.c. 10 per cent glucose solution intravenously. Six hours after operation patient was fully conscious and had no unusual complaint. The blood pressure was 152 over 98. No urine had passed per catheter. She had a fairly comfortable night and next morning seemed to be in good condition, no unusual abdominal pain, no distention, no pain over either kidney region. No urine had been obtained per catheter since operation twenty hours previous. It was then realized that anuria had developed. Additional saline and glucose were given and fluids were forced by mouth along with treatment to stimulate diuresis. Thirty hours after operation patient began showing signs of uremia with evidence of myocardial failure. No urine had passed up to this time. Thirty-six hours after operation patient expired. An autopsy was performed and the cause of death was given as acute dilatation of heart, chronic myocarditis, chronic nephritis and arterioselerosis. During the course of the autopsy it was found that the left ureter was ligated about 5 cm. from the bladder. The right ureter was in good condition. There was no marked difference in either of the kidneys. They did not show evidence of hydronephrosis, etc., as you would expect in case of obstructed ureters. No doubt, the anuria was the result of constitutional causes and not the result of ligation of the left ureter.

Case 2.—Mrs. A. H., aged thirty-five years. Hospital No. 818. On May 11, 1916, she was operated upon for myoma of the uterus. A supravaginal hysterectomy with double salpingooophorectomy were performed. The postoperative course was stormy and on the fourth postoperative day patient showed signs of uremia. No urine had been obtained since operation; cystoscopic examination revealed both ureters blocked a short distance from the bladder. It was then decided to open the abdomen and attempt to deligate the ligated ureters. A description of the operation is as follows: Abdomen opened through old incision. Much fibrin and clear serous fluid were present. The right kidney was enlarged with the ureter distended to about the size of small finger. About 2 cm. below the pelvic brim a ligature was found around it, a second ligature was around the ureter at about the position of the internal os of the uterus. The ligatures were cut and the ureter freed. Left ureter apparently was not definitely ligated but edematous and enlarged. The stumps of the cut adnexa and ligaments of the uterus had been drawn over the ureter during previous operation.

These sutures were cut and the ureters freed. Abdomen closed hurriedly with drainage. Patient returned to ward in poor condition. She died from general peritonitis thirteen days after the operation. There is no history of any passage of urine following operation.

CASE 3.—Mrs. B. F., aged sixty-six years. Hospital No. 2031. On Sept. 22, 1919, was operated upon for cancer of cervix uteri. A complete vaginal hysterectomy and double salpingooophorectomy were performed. The postoperative course was stormy and thirty days after operation urine dribbled from the vagina. Cystoscopic examination revealed a left ureterovaginal fistula. She was discharged from hospital after thirty days with ureterovaginal fistula present. She reentered the hospital later and reported the dribbling of urine from the vagina ceased after eight months. Cystoscopic examination at this time revealed no function of left ureter with a dead kidney. Right kidney in good condition. Patient also had diabetes mellitus.

CASE 4.—Mrs. B. S., aged forty-three years. Hospital No. 2206. On April 16, 1920, was operated upon for retrodisplacement of uterus, chronic cervicitis and cystoma of right ovary. A complete abdominal hysterectomy with double salpingooophorectomy were performed. The postoperative course was stormy. Twelve days after operation a rectovaginal fistula and a ureterovaginal fistula were noted. She was discharged from hospital twenty-eight days after operation with ureterovaginal fistula present. The rectovaginal fistula closed spontaneously. Patient reentered the hospital two months later complaining of dribbling urine from vagina. Cystoscopic examination revealed no function from right ureter into bladder. The left catheter passed easily and function was normal. The right kidney was large and filled with pus. A right nephrectomy was performed. The postoperative course was uneventful, and patient was discharged from hospital twenty days after operation.

CASE 5.—Mrs. M. W., aged forty-four years. Hospital No. 2260. On June 8, 1920, she was operated upon for myoma of uterus (large). A complete abdominal hysterectomy and double salpingooophorectomy were performed. The postoperative course was stormy. Four days after operation a ureterovaginal fistula developed which persisted throughout hospitalization. She was discharged from hospital forty days after operation with ureterovaginal fistula present. Cystoscopic examination made before discharge from hospital revealed bladder normal: right catheter passed easily to kidney. Left catheter met obstruction 3 cm. from bladder. Patient advised to go home and come back later for treatment for ureterovaginal fistula. She never returned to hospital and nothing further was heard from her.

CASE 6.—Mrs. W. M., aged thirty-nine years. Hospital No. 10903. On July 14, 1921, she was operated upon for early carcinoma of cervix uteri. A complete hysterectomy with double salpingooophorectomy were performed. During the operation both ureters were isolated and apparently not injured. The postoperative course was moderately stormy. Eight days after operation a ureterovaginal fistula developed. She was discharged from hospital thirty-four days after operation with ureterovaginal fistula present. Patient reentered the hospital four months later, at which time cystoscopic examination revealed normal bladder. Left catheter passed easily to kidney. Right catheter met obstruction 2½ cm. from bladder. She was discharged from hospital to return two months later for operation on ureterovaginal fistula. She reentered the hospital at the appointed time and the operation was carried through, making a right inguinal incision. The ureter was isolated and found greatly distended and led from the kidney to the vaginal vault. It was freed and transplanted into the bladder without tension. Three days after operation urine flowed from the abdominal incision and it was plainly seen that an abdominoureteral fistula had formed. After thirty days urine ceased to flow from the wound and it healed nicely. Patient was discharged from hospital without doing a cystoscopic examination. January 1, 1931, nine and one-half years after first operation cysto-

scopic examination and x-ray plate showed a dead right kidney. Function of left kidney normal.

CASE 7.—Mrs. A. C., aged twenty-nine years. Hospital No. 16862. On Sept. 4, 1928, she was operated upon for myoma of uterus. A supravaginal hysterectomy with double salpingoooophorectomy were performed. During the course of the operation the right ureter was severed near the bladder. It was immediately transplanted into the bladder without tension. The postoperative course was stormy and the patient complained of great pain in right kidney region. No fistula developed. A few days after operation it was discovered patient had a right pyonephrosis and the transplanted ureter was not functioning. Thirty days after operation the right kidney was removed. She had an uneventful postoperative course and was discharged from the hospital nineteen days later in excellent condition.

CASE 8.—Mrs. D. C., aged forty-nine years. Hospital No. 30848. On August 13, 1931, she was operated upon for chronic subinvolution of uterus and chronic salpingitis. A complete abdominal hysterectomy with double salpingoooophorectomy were performed. The postoperative course was markedly febrile. Patient discharged from hospital Aug. 31, 1931, eighteen days after operation with some temperature present. On the seventeenth postoperative day dribbling of urine was noticed coming from the vagina. She was discharged with this condition present. Two months later patient began having severe pain in the lower abdomen, chills, and temperature. She urinated often and passed small quantities of urine. On Oct. 22, 1931, she returned to Barnes Hospital complaining of urine passing from vagina. Patient admitted to the Genitourinary Service and a diagnosis of ureterovaginal fistula was made. Cystoscopic examination revealed a good left kidney and ureter. The right catheter met an obstruction about 2 cm. from the bladder. On Nov. 11, 1931, a right nephrectomy was performed. The kidney was enlarged twice its normal size and the pathologic report showed an acute hydronephrosis with chronic pyogenic nephritis. Patient had an uneventful postoperative course and was discharged from the hospital Nov. 27, 1931, in excellent condition.

Much of the literature dealing with ureteral injury and ligation is in the form of case reports. However, in the past few years the subject is receiving more attention and a few investigators have attempted to correlate the cases and large series have been reported. P. Brooke Bland has collected 441 cases, 361 were unilateral and 81 bilateral injuries or ligations. Of these Leon Herman reported 24 cases, all bilateral. Barney has reported 62 cases including 32 presented by Sampson in 1902, and Oeconomos has collected a series of 159 cases. The additional 196 cases were from several investigators in various parts of the country. Forty-two surgeons reported 125 cases ranging from one to eight. H. Kayser reported the cases in the clinic of Professor Franz, Charite Hospital, Berlin, for five-year period. He listed 29 instances of injury or ligation of the ureters and quotes Wertheim as having had 49 injuries among 500 hysterectomies for uterine carcinoma. T. S. Burr refers to 630 hysterectomies for cancer of the uterus in which a single ureter was injured 13 times and both ureters once.

From a study of the cases reported, it is evident the greatest percentage of ureteral injuries followed radical hysterectomies for uterine carcinoma and the most common sequelae were ureterovaginal fistulae.

Most of the textbooks in gynecology outline the treatment for ureteral

fistulae following injury in which the ureter may be cut or crushed with a clamp, or the blood supply interfered with to such an extent that necrosis and sloughing follows. Very little is said about the treatment when one or both ureters are ligated.

From an analytical study of the eight cases reported in this presentation, together with a careful consideration of the several hundred cases reported in the literature by numerous excellent investigators, I desire to offer an opinion as to what method of treatment seems most suitable for handling this most perplexing problem. In presenting this, I should like to sound the warning note of prophylaxis. I am quite sure many cases of ureteral injury can be avoided if modern technic is followed when performing an extensive pelvic operation. I am sure every gynecologist is conscious of the fact the ureters may be injured during the course of almost any pelvic operation. The radical abdominal hysterectomy operation for uterine carcinoma tops the list of ureteral injuries, vaginal hysterectomy next, then complete abdominal hysterectomy for myoma, etc. Therefore, when performing any of these operations, or any other extensive pelvic operation, I would suggest as a prophylactic measure, that the ureters be isolated according to the familiar technic. As an additional safeguard catheters may be inserted into the ureters before starting the operation, as suggested by Kelly many years ago.

At the Time of Operation.—If it is discovered that one or both ureters have been ligated, the proper treatment is to deligate as soon as the condition is recognized. Ordinarily, the ligature around the ureter is not sufficient to cause permanent injury. If one or both ureters have been severed, a ureteroureteral anastomosis should be performed by one of the various accepted methods. Transplanting the ureter into the bladder is only fairly satisfactory, as the contraction of the wall of the bladder constricts the ureter, eventually causing a pyonephrosis and death of the kidney. Some few successful cases of ureteral transplant into bladder have been reported. Of course, if the patient is in bad shape and only one ureter is damaged, a ligation may be done, which will cause death of the kidney. This is a sacrificial operation and only considered as a last resort. The ureteroureteral anastomosis operation is the one of choice.

Peterson in an analysis of 72 cases of ureteroureteral anastomosis has shown it is usually successful, claiming that the different methods are equally effective in the hands of different operators. He found in 29 cases of the end to end operation, leakage occurred in 9. In 25 end in end operations leakage occurred in 5, and in 15 end in side operations leakage occurred in only 2. As to final results one must consider in all these operations that in a small percentage of the cases there will be contraction of the scar at the site of the ureteral repair with complete occlusion of the ureter and death of the kidney on that side, but as a whole this is negligible.

A. H. Curtis has described a simple and practical method of end to end ureteral anastomosis. A ureteral catheter is passed into the cut ureter and the lower end brought out through the bladder and urethra, the two ends of the ureter are sutured together, taking care not to penetrate the lumen of the ureter with the sutures. A second ureteral catheter is placed into the ureter above the point of the anastomosis through a small slit and passed up to the pelvis of the kidney so as to divert the passage of the urine away from the regular course. This catheter is brought out through a stab wound in the flank. After ten days both catheters are removed. Warner S. Bump and Stanley M. Crowe of the Gynecological Department of Northwestern University Medical School worked out the technic on dogs and the operation was successfully performed six times. In not a single case did a urinary tract infection take place and necropsy of the animals showed perfect function of ureter and kidney. Curtis has performed the operation once upon a woman with complete success. He has made no other attempts.

Such a technic is both practical and simple. Heretofore, many failures of end to end anastomosis have been due largely to infection following the leakage of urine around the end to end contact, causing peritonitis or adhesions about the ureter, later resulting in contraction of the ureter at the site of the anastomosis, hydroureter and death of the kidney. With the use of the ureteral catheter as a splint, the operation need not necessarily be water tight. Coaptation of the two ends over the catheter with enough fine sutures to make them fast is all that is necessary, as the catheter which has been passed up to the pelvis of the kidney and brought out through the flank reroutes the urine and thus allows epithelization of the ends of the severed ureter to take place.

If it is discovered that the ureter has been crushed by a clamp, the injury should be carefully examined and if it is determined to be severe, end to end anastomosis should be done in order to prevent a ureterovaginal or ureteroabdominal fistula. If the injury is not severe, circulation may be restored and healing take place without fistulas forming. Furniss reports two cases in which clamps were on the ureters from seven to eight minutes and in both instances fistulas developed, one in eight days, the other after twenty days. Crossen in a personal communication informed me he had placed a clamp on a ureter for several minutes and a ureteral fistula followed. Kayser mentions seven cases in which only the sheath of the ureter was injured and of these, two developed fistulas. Harrington crushed the ureter in dogs with a forcep from one to thirty minutes and noted no fistulas forming, but at the point of crushing, scar tissue formed with constriction and dilatation of the ureter thus leading to hydronephrosis and degeneration of the kidney.

Several Days After Operation.—If both ureters have been ligated and this is not discovered until two to four days after operation, the condition

is a serious one. The patient ordinarily has a complete anuria with uremia and something very urgent must be done. Two things are to be considered: (1) Deligation of the ligated ureters. (2) Nephrostomy. Not enough cases have been handled by either method for one to draw any definite conclusion. Of course, deligation is the operation of choice, if the patient's condition is such she can endure a serious operation. It must be remembered that uremia is present and ordinarily the patient is a poor operative risk, and searching for the ligated ureters is not easy, also after locating them, can the patient stand a ureteroureteral anastomosis or whatever sort of operation one deems fit and proper? On the other hand, is nephrostomy the choice? Certainly, it seems to be the best operation when the patient's condition is grave, as it can be quickly carried out, and when the patient's general condition improves, if necessary, then deligation may be attempted. As regards double nephrostomy, Caulk has made the following statement: "In double ligation, your only chance is to do a double nephrostomy as quickly as you can. The ideal method would be immediate deligation, but this is attended with considerable difficulty, as searching for a tie on a ureter deep in the pelvic cavity several days after an extensive resection is difficult. Even in animals it is difficult to untie without cutting the ureter. In several instances in which I have known of its being done clinically, the ureter had been incised with a resulting fistula or a ureterovesical anastomosis performed at the time." Caulk and Fischer's experimental work on ureteral ligation on the dog is very interesting and deserves considerable thought. They have shown that No. 2, plain catgut when tied around the ureter was never absorbed before the end of three weeks, and that twenty-day and forty-day chromic catgut, which is the most commonly used in pelvic work is not absorbed for a much longer time, so it is useless to wait for the absorption of the catgut.

I cannot fully agree with Caulk and Fischer as to the length of time catgut lasts in the human pelvis. In the dog the absorption of catgut may be very slow and extend over a period of many days, but in the human being I am quite sure catgut is more readily absorbed, and the time of absorption is in proportion to the kind of catgut used. My opinion is based on the fact I have had occasion to open a few abdomens seven to twelve days following pelvic operations and have in some instances found the No. 2, twenty-day chromic catgut practically absorbed.

Caulk's conclusions were no doubt drawn from this piece of experimental work on the dogs and the successful management of a case of double ureteral ligation in a patient who came under his care. The patient on whom both ureters had been ligated during the course of a complete abdominal hysterectomy for fibroids, had not passed urine for eight days. It was recognized early that both ureters had been tied but the surgeon awaited developments, thinking that possibly the catgut would

loosen and the ureters would open spontaneously. At the end of the eighth day the patient became uremic. He performed a double nephrostomy upon her and during the next twelve hours 3000 c.c. of urine were secreted. Drainage through the nephrostomy tubes was free until the fifty-eighth day when the patient voided. Ten days later the urine was passed entirely by the bladder and the wound had healed. In a personal communication, Dr. Caulk informed me the patient is now living and enjoying good health.

This brings up the question of how long can a patient live with complete anuria. Caulk's patient had anuria for eight days. Myers reports 19 cases of complete anuria lasting from twenty to twenty-nine days. Farlow reports a case lasting thirty-five days, Parr forty-two days and Baily fifty days. However, these cases did not follow double ureteral ligation.

The arguments for bilateral nephrostomy as advocated by Caulk are most convincing, but when one searches the literature carefully he finds that Caulk's cases of double nephrostomy are the only successful cases reported. E. S. Judd reports a case of double nephrostomy who had an anuria for three days and seven days after the operation passed urine from the bladder. This case does not seem to be one of double ureteral ligation but rather one of urinary suppression.

Herman cites 24 cases of bilateral occlusion, 15 of which were due to encircling ligatures. The other 9 were from various causes. Of these 24 patients, 1 died without operation and the remaining 23 were operated upon. Seven died immediately following operation, a primary mortality of 30.4 per cent. The primary mortality among the 10 nephrostomy cases was 50 per cent. Among the 8 cases of deligation it was 25 per cent. All of the patients, 6 in number, who recovered from the operation of deligation were cured permanently.

In dealing with bilateral ureteral ligations the following conclusions are drawn:

1. The method of treatment, selected for the relief of bilateral ureteral obstruction will depend upon the cause of the obstruction, upon the individual choice of the operator, and upon the time that has elapsed since the receipt of the injury. Also, upon certain factors that were present at the time of the primary pelvic operation.

2. Delay in operative treatment is dangerous and will eventually result in death.

3. That deligation is the treatment of choice provided the patient's general condition can stand the strain of serious operation, and if not nephrostomy with drainage.

Ureteral Fistulas.—Ureteral fistulas which are the most common sequelae of ureteral injury, usually occur from three to twelve days after operation and may be either vaginal or abdominal, the former more common than the latter. Ureteral fistulas occur (a) when the ureter is severed, either partially or completely, or (b) the blood supply so injured by clamping, etc., that necrosis occurs, or (c) as a result of stripping the ureter of the blood supply, necrosis follows. A cystoscopic examination with ureteral catheterization should be performed in order to locate which ureter is not functionating into the bladder, and also to determine the

condition of the other kidney. It is probably best to wait from one to six months after the primary operation before attempting operation from the cure of the ureteral fistula as sometimes from the scar tissue contraction, the fistula is cured spontaneously. Usually in such cases a hydronephrosis develops with infection and death of the kidney, but if operation is attempted too early after the formation of the fistula, the patient is not in a suitable condition to stand the operation, whereas, after one to six months much better results would be obtained.

In selecting the type of operation for the cure of this condition, one must consider ureteroureteral anastomosis, ureteral vesical anastomosis and ureteral transplant into skin, bowels, etc., also ligation of ureter and nephrectomy. The aim of any operation should be to preserve the kidney and not destroy it unless nothing else can be done. Several vaginal operations have been recommended for ureterovaginal fistula correction, colpocleisis, ureterovesical anastomosis, etc., but none of them seem to be satisfactory. It seems to me that the best plan to follow in dealing with ureterovaginal and ureteroabdominal fistulas is to put the plain facts of the condition to the patient, state the chances of a failure if anastomosis is attempted and that it might be necessary to undergo a second operation for removal of kidney. Also, discuss the removal of the kidney on the affected side, after the other kidney has been pronounced normal, and if she desires, a nephrectomy may be performed outright and thus avoid the possibility of two serious operations.

CONCLUSIONS

1. From the large number of cases of ureteral injury reported, it is evident that the accident is a surgical complication far more common than one would suspect.

2. No doubt some unilateral ligations occur during the course of pelvic operation and are unrecognized, the ultimate result being death of the kidney on the corresponding side.

3. The accident is liable to follow almost any pelvic operation, but usually after radical abdominal and vaginal hysterectomies.

4. In most cases the injury is unilateral. In a certain number of cases both ureters are involved.

5. The most common sequelae of ureteral injury are vaginal and abdominal fistulas.

6. As a surgical complication, ureteral injury is responsible for a certain number of deaths.

7. Prophylaxis is most important.

8. Should a ligature or clamp be placed on a ureter and serious damage inflicted, immediate repair should be done in the form of ureteroureteral or ureterovesical anastomosis.

9. In case of bilateral occlusion discovered a few days after operation,

removal of the ligatures indicated if patient's condition can stand the strain of a serious operation; if not nephrostomy with drainage.

10. Nephrostomy is a life-saving operation and should be done in all cases of double ureteral obstruction when the patient's condition is grave.

11. Vaginal correction of ureterovaginal fistula is unsatisfactory. Abdominal operation is the choice either in the form of ureteral anastomosis or nephrectomy.

12. An operation designed to correct a damaged ureter should aim to preserve the normal ureteral and kidney function.

REFERENCES

(1) *Baily, T. L. W.:* Charlotte M. J. **7**: 537-540, 1895. (2) *Barney, J. D.:* Trans. Am. Assn. Genito-Urin. Surg. **7**: 201-228, 1912. (3) *Barney, J. D.:* Ann. Surg. **51**: 362-381, March, 1910. (4) *Barney, J. D.:* Surg. Gynec. Obst. **15**: 290-295, 1912. (5) *Bland, P. B.:* Atlantic M. J. **27**: 341-356, March, 1924. (6) *Bump, W. S., and Crowe, S. M.:* Surg. Gynec. Obst. **49**: 346-351, 1929. (7) *Burr, T. S.:* Phys. & Surg., Detroit, Mich., 1902. (8) *Caulk, J. R., and Fischer, R. F.:* Surg. Gynec. Obst. 343-349, 1920. (9) *Caulk, J. R., and Fischer, R. F.:* Trans. Am. Assn. Genito-Urin. Surg. **10**: 72-81, 1915. (10) *Crossen, H. S.:* Personal Communication. (11) *Curtis, A. H.:* Surg. Gynec. Obst. **48**: 320-322, 1929. (12) *Farlow, J. W.:* Boston M. & S. J. **120**: 330-334, 1889. (13) *Furniss, H. D.:* Surg. Gynec. Obst. **27**: 339-342, 1918. (14) *Harrington, S. W.:* Arch. Surg. **2**: 547-592, 1921. (15) *Herman, Leon:* J. Urol. **9**: 151-179, 1923. (16) *Judd, E. S.:* Lancet **31**: 543-547, 1912. (17) *Kayser, H.:* Med. Press & Circ. 99-106, 1915. (18) *Keely, H. A.:* J. A. M. A. **24**: 860-864, 1900. (19) *Myers, W. A.:* J. A. M. A. **85**: 11-13, 1925. (20) *Parr, B.:* London Medical Dictionary **1**: 836, 1819. (21) *Peterson, R.:* Surg. Gynec. Obst. **31**: 132-142, 1920. (22) *Sampson, J. A.:* Am. Med. **4**: 693-700, 1902. (23) *Oeconomos, Sp. N.:* Gaz. d'hop., Paris **94**: 197-204, 1921.

411 WALL BUILDING.

ABSTRACT OF DISCUSSION

DR. B. Z. CASHMAN, PITTSBURGH, PA.—In extensive pelvic dissections, and particularly in bilateral intraligamentous tumors, if there is doubt as to the location of the ureters, they should be exposed and kept in the field of vision at all times. The use of radium in the treatment of carcinoma of the cervix, instead of the Wertheim operation, should undoubtedly decrease the incidence of ureteral injury, but I am afraid that this will be counterbalanced by the present tendency to do total hysterectomy for benign conditions of the uterus. I looked up our cases in the Magee and St. Francis Hospitals in Pittsburgh and will give the figures for comparison. Dr. Newell reports 1202 supravaginal hysterectomies with 2 ureteral injuries. We had 1419 supravaginal hysterectomies with 2 ureteral injuries, practically the same. He reports 63 vaginal hysterectomies with 1 ureteral injury, while we had 110 vaginal hysterectomies with no ureteral injury. But in total hysterectomy he reports 5 ureteral to our 1. However, on examining the figures, I find that total hysterectomy was done 4 times as often in his series as in ours, and therein lies the story.

The principle of total hysterectomy is correct in that it removes a diseased cervix, but this can be accomplished in a much more simple manner, by thoroughly cauterizing the cervix and doing supravaginal hysterectomy. It has been stated that as most of the carcinomas of the cervix are of the squamous cell type, carcinoma develops from the squamous epithelium and therefore it is necessary to remove the entire cervix. We maintain that carcinoma develops from the squamous epithelium only, because of the adjacent chronic infection, inflammation and irritation, and that if this is thoroughly destroyed with the cautery, it heals over with squamous epithelium and there is no more danger of carcinoma arising in that cervical stump than in the

squamous epithelium of the vagina. There has been no development of carcinoma in the cervices of our 1419 supravaginal hysterectomies, all of which were treated in this manner. On the other hand, in a series of 150 cases of carcinoma of the cervix analyzed a few years ago, we found that four had developed in the cervix after supravaginal hysterectomy, in which the cervix had not been cauterized nor was any method used for eradicating the infection in the cervix.

In the very obese patient, in the deep narrow pelvis, or when the cervix is fixed by deep tears or by contraction of parametrial tissue from long standing inflammation, total hysterectomy is a much more difficult procedure, exposure is difficult and it is in this type of patient that the ureter may be damaged. If one then decides to do supravaginal hysterectomy, a diseased cervix is left behind, thus defeating the very purpose of this operation.

In bilateral ureteral injury, while deligation would seem to be the ideal treatment in that it permanently corrects the trouble, it is much less certain and therefore is not always the practical operation. The condition of the patient and the nature of the original operation will help one to decide. If it is felt that the ureters were severed, nephrostomy is the procedure of choice. Bilateral nephrostomy is a certain method of relieving the back pressure on the kidney, the emergency which confronts the patient. The mortality of 50 per cent for nephrostomy as given by Dr. Newell is too high, I believe, and is due to delay in operating. In a patient who has anuria the next day after pelvic operation, the passage of ureteral catheters will quickly determine whether it is suppression of urine from malfunction of the kidneys, or anuria due to ureteral obstruction. If it is the latter, operation should be done at once and not after three, four, five, or six days.

DR. JAMES R. MILLER, HARTFORD, CONN.—I wish to report a case which is unusual in some respects. The patient came to me in May, 1926, with a small fibroid uterus and a large cystadenocarcinoma of the ovary the size of a 32 weeks' pregnancy. At operation about two inches of the right ureter were removed accidentally. The bladder end of the ureter had been ligated at the time of hysterectomy. The sigmoid was fortunately movable and was sutured to the right brim of the pelvis and, not knowing at that time what the Coffey method was, I implanted the ureter into the right sigmoid practically with the same technic. This patient has survived six and a quarter years, and aside from a single attack of pyelitis on the fourth day, has been entirely free from symptoms. Her bowels move three or four times in the morning without discomfort and she never has to resort to a cathartic. This spring I had her come into the hospital and was able to visualize both kidneys.

DR. NEWELL (closing).—I think Dr. Cashman is perfectly right about the proportion of total hysterectomies in relation to the supravaginal operations. Of course, this is a topic that is discussed quite often. I am more and more frequently doing the supravaginal, cauterizing the cervix, but I cannot feel that it is good judgment to leave the cervix unless it is in good condition. Our teaching is to leave the cervix if possible but to remove it if the conditions warrant at the time of operation.

There have been eight ureteral injuries by six different gynecologists, rather a small percentage.

There is much discussion regarding the choice of deligation or nephrostomy. I have felt that nephrostomy is the better operation, having seen only one case where deligation was tried. It is a most difficult thing to deligate a ureter even if it is as large as your finger and I do not think it is wise to do so if nephrostomy will be beneficial.

I have quoted a good deal from the work of Caulk and Fischer. I have disagreed with them in some respects because I have seen at autopsy that the ligatures are absorbed more rapidly than experiments would indicate. I am quite sure that in fifteen or twenty days the ligatures are absorbed.

FOREIGN BODIES LEFT IN THE ABDOMEN AFTER OPERATION*

J. P. GREENHILL, M.D., CHICAGO, ILL.

DURING the last three decades, there has been a remarkable improvement in the technic associated with abdominal operations. This applies not only to the increase in skill and dexterity of surgeons but also to the advancement made in the problems of operating room facilities, lighting equipment, instruments, anesthesia, and other factors. Because of the dangers to the patient of leaving foreign bodies within the abdomen and also because of the direful consequences to the surgeon of a lawsuit as a result of this, efforts have always been made to prevent such occurrences. During the last twenty-five years many recommendations have been made on how to check up the loose armamentarium used during an operation. At present most hospitals have rather elaborate systems for this purpose and the common belief is that it is an extremely rare occurrence for an instrument or a sponge to be left in the abdominal cavity after an operation. Yet a high official in a large insurance company which protects physicians and dentists against malpractice suits informed me that his company takes care of approximately one hundred suits dealing with foreign bodies each year. Also that about one in every fifteen suits for malpractice against physicians and surgeons is for a foreign body. Since there are many insurance companies which insure physicians against malpractice suits, we can only conjecture the appalling number of foreign bodies left in patients after operations.

As far as I know only three of all these hundreds of malpractice suits have been reported in medical literature, although more of them may have been recorded in the medicolegal section of the *Journal of the American Medical Association*.

The large majority of malpractice suits for foreign bodies never reach the courts because for obvious reasons they are settled out of court. In spite of this however, I found records of 68 cases of foreign bodies carried to the courts of the various states in this country from 1897, when the first case was apparently recorded, to 1925. These 68 cases represent only those cases which were taken to court and on which a verdict was rendered. Where a case was not taken to court and even where it was taken to court but no verdict was rendered, either because the suit was dropped or for some other reasons, it was not included in these 68 cases. In many of the cases where verdicts were rendered, they were in favor of the patient. Even in the cases where the surgeons were absolved from responsibility,

*Read at the Forty-Fifth Annual Meeting of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, French Lick Springs, Ind., September 12, 13, and 14, 1932.

most of them suffered incalculable harm as a result of the odious notoriety usually associated with such lawsuits.

The question of guilt has not been answered by all courts in the same way. In answer to a query in the *Journal of the American Medical Association* the following information was given:

"Responsibility for allowing a surgical instrument or other foreign body to remain in the abdomen after an abdominal operation rests on the party through whose default, or through the default of whose agents, it was allowed so to remain. To locate that default on the proper party, it is necessary first, to ascertain the respective duties assumed by each of the several participants in the operation, personally and through his agent. Then it must be ascertained which of such participants defaulted in the discharge of the obligations that they had assumed with respect to the patient, and by whose default the patient was as a proximate result injured. The duties assumed by each of the several participants in the operation must be determined according to their respective relations to the patient, arising out of contracts, expressed or implied, or out of the relations between the parties independent of contracts. Such relations, so far as they are not fixed by contracts, are determinable from a study of the general customs relating to such operations, and of local and special customs a knowledge of which, prior to the operation, is brought home to the patient. No hard and fast rule can be laid down for determining the division of responsibility between the operating surgeon and the hospital. Charitable hospitals, however, are in many jurisdictions held to be free from liability to their patients, except for such injuries as may result from a failure on the part of the hospital to exercise due care and skill in selection of its agents and employees."

In certain states including Illinois, Indiana, New York, Massachusetts and others, the courts hold the following point of view. Every modern hospital has nurses who count sponges and instruments before and after operations. At the request of the surgeon they report that all the sponges and instruments are accounted for at the end of an operation. If there is a mistake in counting, it is due to negligence of the nurse who is in the employ of the hospital. The surgeon is not responsible in such a case. Unlike charitable hospitals private hospitals are not immune in any state.

The above discussion deals with foreign bodies, the presence of which sooner or later becomes known to the patient or to the patient's relatives. In addition to these cases there is a very large number in which foreign bodies are accidentally found by surgeons who usually make no mention of their discovery to the patient or to his or her relatives. In fact very few of these cases are made known to anyone except those in the operating room, because of the desire to protect the surgeon who performed the first operation. Many surgeons in conversation will reveal having removed one or more foreign bodies which they or others have left behind, but they seldom report these facts in medical literature. In support of this contention I should like to cite the report of White. This author sent inquiries to surgeons in all parts of Great Britain asking for *unpublished* cases of instruments left in the peritoneal cavity after operation. He specifically requested that forgotten laparotomy pads and gauze sponges be omitted and in spite of this he received details of 39 instrument cases. White him-

self had two cases and there were three additional specimens in the Museum of the British College of Surgeons. In this series of 44 cases, eleven patients died (25 per cent). Likewise Schachner sent letters to many surgeons in the United States and all but four reported that they themselves had left one or more foreign bodies in the abdomen.

There is still a third group of forgotten foreign bodies, namely, those in which the mishap remains unrecognized. Undoubtedly there are patients in whom foreign bodies have been left and who die of peritonitis or other causes. There is no suspicion of the true cause of the peritonitis because an autopsy is not performed. That such cases are not infrequent is proved by the relatively large number of foreign bodies which were discovered accidentally at postmortem examinations.

In the literature a relatively large number of articles devoted to this subject have appeared, especially in the first decade of the present century. The most extensive papers with a compilation of cases are those by Neugebauer (1900), Schachner (1901), Goerlich (1908), Crossen (1909), and Albitzky (1917). In reviewing the literature from 1859 to 1908 Crossen found reports of 172 sponges and 51 forceps and other articles left as foreign bodies after abdominal operations. In addition he found 18 cases of foreign body left after vaginal operations. Among the 172 sponge cases, the end-results were as follows: 83 patients (48.3 per cent) recovered, 53 patients (30.8 per cent) died, and in 36 cases (20.9 per cent), the outcome was not mentioned. Among the 50 patients with forceps or other instruments (in one patient two forceps had been left, hence the 51 instruments in 50 patients) the results were as follows: 17 patients (34 per cent) recovered, 14 patients (28 per cent) died, and in 19 cases (38 per cent), the results were not stated. Hence among the entire 222 patients with foreign bodies, 100 patients (45 per cent) recovered, 67 patients (30.2 per cent) died, and in 55 cases (24.8 per cent), the end-result was not stated. In this series of 222 cases, the original operation during which the foreign body was accidentally left, was an abdominal one in 30 cases (13.5 per cent), a pelvic one in 86 cases (38.7 per cent), and in 106 (48.7 per cent) cases, the type of operation was not listed. In 52 of the 222 cases (23.4 per cent), the foreign body was discovered at autopsy.

In Albitzky's series 56.8 per cent of the patients were females, 3.2 per cent were males, and in 40 per cent, the sex was not stated. In 80.4 per cent the foreign bodies were left during gynecologic operations, and in 19.6 per cent during other types of surgical operations. In this series 48.5 per cent recovered, 23.5 per cent died, and in 28 per cent, the outcome was unknown. In 38 per cent the foreign body was removed during a second operation, in 20 per cent it was expelled spontaneously, in 2.1 per cent it was found at autopsy and in the remaining 21 per cent there was no report as to how the foreign body was discovered.

I had the unusual experience of finding three foreign bodies within eleven months. Brief abstracts of these cases are as follows:

CASE REPORTS

CASE 1.—Mrs. I. B. (No. 1,043,841), aged thirty was admitted to the Cook County Hospital on January 4, 1928 because she had a persistent, purulent discharge from an abdominal wound, chills, fever, nausea and vomiting and had lost 25 pounds in the last five weeks. The family history was negative. The past history was unimportant except for two operations performed at another local hospital ten weeks and five weeks respectively before admission to the Cook County Hospital. A posterior colpotomy had

been done the first time. Five weeks later a laparotomy was performed and both tubes and ovaries were removed. (Inquiry at the hospital where the operations were performed elicited the information that both tubes and ovaries had been removed but not the uterus.) Immediately following the laparotomy, a purulent discharge escaped both from the abdominal incision and from colpotomy wound. Then the patient had chills, fever, and anorexia, and she vomited most of her food. She left the hospital in this condition. The general physical examination on admission to the Cook County Hospital revealed no abnormalities other than extensive emaciation, marked pallor, and a foul odor. The temperature was 102.6° F., the pulse was 108 per minute and respirations were 26 to the minute. The blood pressure was 110/70. The red blood cell count was 1,180,000, the hemoglobin was 30 per cent, the white blood cell count was 4,400 of which 62 per cent were polymorphonuclear leucocytes, 24 per cent were large lymphocytes, 10 per cent were small lymphocytes, and 4 per cent were myelocytes.

Abdominal examination revealed a low midline scar, well-healed, except at the lower end where there was a sinus. From this sinus foul-smelling pus escaped. Vaginal examination was made with difficulty because the introitus and the vagina were very tight. The cervix was small and hard. Behind the cervix, the colpotomy opening could be felt and through it, the same type of pus escaped as came out of the abdominal sinus. The body of the uterus could not be outlined but the entire pelvis was found to be indurated. The diagnosis made was pelvic abscess due to a foreign body or tuberculosis with secondary infection. The Wassermann reaction was negative. An x-ray picture was taken and a shadow of a straight pin was found anterior to the right half of the sacrum. Roentgen ray pictures were repeated twice on different days and the straight pin was found in the same position each time. A lateral projection picture showed the pin to be at the level of the sacral promontory.

The patient refused to be operated upon and left the hospital. We could not trace her.

The straight pin had probably been accidentally enclosed in a package of gauze pads or sponges when these were wrapped or the pin was dropped when a package of gauze pads was opened during the operation.

Case 2.—Mrs. L. H., aged thirty, was admitted to the Cook County Hospital on May 24, 1928 because of pain in the lower abdomen. She had been married ten years but had never been pregnant. The family and past histories were unessential except for an appendectomy performed in Ohio three years before admission. The patient felt entirely well until six weeks before the present admission to the hospital. From that time on she experienced a constant, dull pain in the lower abdomen. This became progressively more severe. The pain was frequently associated with nausea but vomiting never occurred. During all this time there was a profuse foul vaginal discharge and constipation.

The general physical examination was entirely negative, except for a temperature of 99.8° F. The red blood cell count was 3,950,000, the hemoglobin 80 per cent and the white blood cell count was 8,900. On abdominal examination tenderness was elicited suprapubically and in the left iliac fossa. No masses were palpable. Vaginal examination revealed hypertrophied labia minora. There was no cystocele or rectocele. The anterior lip of the cervix was hypertrophied, smooth and not lacerated. The fundus of the uterus was enlarged, very hard, anteflexed and moderately movable. When the uterus was pushed backward the patient complained of great pain. The right tube was enlarged and tender. The left adnexa were converted into a very tender cystic, adherent mass. In addition to these masses there was a round, exquisitely tender, slightly irregular mass in the culdesac. The diagnosis made was fibrosis uteri; left tuboovarian abscess, right salpingitis and prolapse of the cystic right ovary. After the patient's temperature dropped to normal and remained so for a few days a laparotomy was per-

formed. Both tubes were enlarged and inflamed. A defundation of the uterus was performed and both tubes and the left ovary were removed. The right ovary was found to be in its normal position and in good condition. The very tender cystic mass which had been felt in the culdesac was easily shelled out and when opened proved to be a gauze sponge surrounded by a thick capsule of fibrous tissue. Convalescence was uneventful and the patient left the hospital on the eleventh postoperative day. The sponge had been left in the abdomen three years previously and had not given rise to any symptoms until perhaps six weeks before I saw her. Even these symptoms were most likely due to the salpingitis rather than to the gauze sponge which was well encapsulated and fairly clean.

Case 3.—Mrs. A. K. (No. 68137), aged thirty-seven was admitted to the Chicago Lying-in Hospital on December 9, 1928. She had had two cesarean sections performed by two different obstetricians, one thirteen years and the other ten years before admission. She was sterilized at the time of the second operation. The menstrual history was negative and her last menses had begun November 27. Her complaint was pain in the abdomen. The general examination was negative. There were two incisions in the lower half of the abdomen which was distended by a hard, somewhat tender mass. The latter apparently rose out of the pelvis and was adherent to the abdominal scars. Vaginal examination revealed a nulliparous outlet. The cervix was long, hard, smooth and way up high behind the symphysis and on the left side of the vagina. The fundus of the uterus was enlarged to the size of a five months' pregnancy, hard, and adherent to the abdominal wall. To the left of the uterus was a soft, slightly irregular cystic mass approximately 8 by 10 cm. in diameter. This mass was very tender. The diagnosis made was fibroid uterus and left ovarian cyst. However, because the patient had not menstruated from March to November, I wished to rule out a pregnancy such as a missed abortion. A roentgen ray picture was taken and much to my amazement a shadow of a large curved needle was seen on the right side. There were no fetal structures to be seen. An operation was performed on December 14, 1928 and great difficulty was encountered because the large fibroid uterus was firmly attached to the abdominal wall, and there were very dense adhesions between the uterus and the adnexa. The fibroid uterus and the adnexa including the ovarian cyst on the left side were removed. A search was then made for the needle, and this was found entirely buried between the folds of the mesoappendix. The needle was removed and then the appendix was amputated. There appeared to be almost no reaction around the needle for it was perfectly clean. Convalescence was disturbed by a wound infection. The patient left the hospital on the seventeenth day following operation. The needle had almost certainly been left in the abdomen at the time of the first operation because the second operator informed me that he had never used such large curved needles at any time in his career.

Review of the Literature

I have reviewed the literature from 1908 (Crossen's comprehensive report) to January, 1932, and found that 109 cases of foreign bodies in the abdomen have been reported in American, British, German, French, Italian, Spanish, and Russian journals. There were a few cases however, which had to be omitted because I could not secure the original journals.

Only those foreign bodies are listed which were left in or gained access to the peritoneal cavity. With the exception of six cases all the original operations were laparotomies. The exceptions were two herniotomies, a colpotomy, a sacral operation, a vaginal pack for abortion and a plastic operation for fat in the abdominal wall.

An analysis of the tabulated cases reveals the following types of foreign bodies:

Gauze	58	(52.2 per cent)
Artery forceps	38	(34.9 per cent)
Needle	4	
Rubber tube	2	
Retractor	2	
Towel clip	1	
Glass tube	1	
Glass rod	1	
Straight pin	1	
Thick thread	1	
	109	

The foreign body was recovered at a subsequent operation in 87 cases (80 per cent), it was expelled spontaneously fifteen times (13.8 per cent), it was discovered at autopsy in 5 cases (4.6 per cent), and two patients are still carrying around their foreign bodies (pin and glass tube respectively).

In the 87 cases where the foreign body was removed by operative procedures, the means of access were as follows:

Laparotomy	75
The bladder	4
The vagina	3
Bier's suction pump	3
A fistula in the wound	2
	87

In 15 cases the foreign body was expelled spontaneously as follows:

Through the rectum	7
Through the wound	5
Through the urethra	1
Through the vagina	1
Coughed up	1
	15

The ultimate results in the 109 cases were as follows:

Recovered	76	(69.7 per cent)
Died	19	(17.4 per cent)
Unknown	12	(11.0 per cent)
Still in the patient	2	(1.9 per cent)
	109	

Of the 75 patients who had subsequent abdominal operations for the removal of the foreign body, 14 or 18.7 per cent died. Among the entire 97 patients in whom the results are known, 19 or 19.6 per cent died as the result of the foreign body, hence these two death rates are almost identical. The length of time the foreign body remained in the abdominal cavity varied considerably. The longest interval recorded was twenty-four years. Likewise the size of the foreign body ranged within wide limits and in one case a laparotomy pad 72 cm. long had been overlooked during an operation for a twisted ovarian cyst during pregnancy.

ETIOLOGY

One or more factors may be responsible for leaving a foreign body in the abdomen. Carelessness on the part of the operator and his assistants undoubtedly accounts for some cases. However unreliability of the nurses who are in charge of counting sponges and instruments before and after operations is the most important factor. Not infrequently the introduction of extra, uncounted sponges or instruments during an operation is the cause of this accident. In some cases the fault lies in a poorly administered anesthestic because of which there is considerable retching, expulsion of the intestines to the outside of the wound, rapid, forcible attempts to replace and hold the intestines back, undue bleeding, haste to complete the operation and other disconcerting occurrences. In a few cases the patient goes into shock and the operator hurries to close up the abdomen without proper inspection of the field of operation. Poor light and untrained assistants, poor exposure of the field of operation, the use of an unnecessarily large number of instruments especially small ones and failure to remove all excess fluids such as serum, blood, and pus are factors in some cases.

PATHOLOGY

In nearly all cases there is some evidence of old or recent peritonitis. The foreign body is surrounded by the omentum and nearby organs which attempt to encapsulate it. Sooner or later however, in most cases, the foreign body exerts pressure and forces an opening into a hollow organ with or without associated signs and symptoms. After this in some cases there is spontaneous expulsion of the foreign body to the exterior but in most cases operative interference is required to remove the offender.

SYMPTOMS

During the first few days after a foreign body has been left in the abdomen there are usually no symptoms by means of which attention would be drawn to this accident. Rarely a patient may describe the sensation of something moving around in the abdominal cavity. A clean smooth instrument is less likely to cause peritonitis than a gauze sponge or pad saturated with blood or pus. After a few days or weeks symptoms generally arise and they are usually the result of peritonitis. In most cases, the omentum rapidly demonstrates its protective mechanism by surrounding the foreign body and shutting it off from the organs in the peritoneal cavity. If this does not occur and sometimes also even when this does take place, serious disturbances arise such as intense pain somewhere in the abdomen, signs and symptoms of ileus, bladder disturbances, rectal tenesmus, abscess formation, the development of a tumor or a fistula, or the protrusion of part of the foreign body through the wound, the rectum or the bladder.

DIAGNOSIS

If a patient has an unusual amount of pain or strange abdominal symptoms soon after a laparotomy, a foreign body should be thought of. Careful abdominal, vaginal (in women), and rectal examinations should be made with the patient lying in various positions and even sitting up. Roentgen ray pictures should be taken including both anteroposterior and lateral views. Instruments will always be revealed by this means but not gauze, unless it has been specially prepared for this purpose or unless it has a piece of metal attached to it. If a long time has elapsed since the operation and the patient has bladder symptoms, cystoscopy is indicated. If there are rectal symptoms, both a digital and a proctoscopic examination should be made before taking the x-ray pictures. If there is a sinus, which persists in spite of treatment, a foreign body should be considered. A large flexible probe should be inserted into the sinus in the hope of encountering an instrument, in which case, a metallic sound will be elicited. Lipiodol or other opaque substance should be injected into the sinus and roentgen-ray pictures taken. If gauze is in contact with the sinus, the opaque substance will saturate it thereby enabling one to detect the gauze in the x-ray pictures. If a protuberance is felt in an abdominal scar it is advisable to cut down to the mass to see what it is. If a mass is felt in the culdesac of a woman, a colpotomy should be performed. In cases where ileus is present a laparotomy is necessary; but even where the symptoms are not alarming it is occasionally advisable to perform an exploratory abdominal operation to seek the cause of vague signs and symptoms which follow a laparotomy.

PROGNOSIS

If a foreign body is removed immediately after it is left in the abdomen, the outlook is excellent. Even if the foreign body is removed within a few days after it is left, the prognosis is very good. The sooner the second operation is performed after the first one, the easier the second operation and the better the results. In cases where the foreign body has been in the abdomen for many years, adhesions make the second operation a serious task. The fact that there was a death rate of 17.6 per cent among the patients who were operated upon in the series I collected for recent years, is proof of the risk to which a patient is subjected when a foreign body is left in the abdomen.

PROPHYLAXIS

It is needless to emphasize that all the sponges, laparotomy pads, dressings, instruments, drains, tubes and other paraphernalia which are prepared for use during an operation must be most carefully checked up both before the operation is begun and before the peritoneum is closed. Another check up should be made while the skin is being sutured. If anything is reported to be missing, the operator must carefully scrutinize the

abdominal cavity while further search is being made by the nurses. During all operations there should be good light, and sufficient exposure of the field of operation. The anesthetic should be administered by a trained anesthetist or by someone under the supervision of a skilled anesthetist. For most laparotomies it is safest to have two assistants. All fluids such as serum, blood, and pus should be removed from the peritoneal cavity and the peritoneum should be left as clean as possible. Blood vessels, certainly the large ones and the moderately sized ones should be clamped or ligated before being cut across to avoid undue bleeding. Long instruments are always preferable to short ones and the fewer the instruments used the safer it is for the patient. It is much better to apply ligatures directly to large vessels and ligaments rather than clamps followed by ligatures. If clamps are used, they should be removed and replaced with ligatures as soon as possible. No gauze sponge, laparotomy pad, or rubber pad should be inserted into the abdominal cavity without having some kind of metal attached to it. Even when the gauze is specially prepared with a substance which will show itself on roentgen ray plates, it is still advisable to attach metal rings, clips or instruments to these pieces of gauze. If only one long piece of gauze is used throughout the operation, the surgeon should be certain that the distal end of it is pinned or tied to its container and the latter in turn attached to the sheet which covers the patient. No piece of gauze, rubber tissue or drain should ever be cut off without the surgeon knowing exactly what disposition is made of the unused pieces. Before the peritoneum is sutured, the surgeon should invariably himself carefully search the peritoneal cavity for foreign substances and then ask the nurses out loud whether all the sponges, laparotomy pads, instruments and other appurtenances are accounted for. He should not suture the peritoneum until he receives an affirmative answer. The personal search and question and answer may prove helpful in a lawsuit.

TREATMENT

If, while the patient is still in the operating room, the surgeon is informed by a nurse that she is sure something is missing, the abdomen should be opened without delay and a search made. If, during the first few days after an operation, there is good reason to believe that a foreign body has been left in the abdomen and certainly if an x-ray picture demonstrates it, a laparotomy should be done without delay unless the general condition of the patient is so poor that a second operation is contraindicated. There is no serious risk in waiting a few days to improve the patient's condition in such a case. In late cases, the treatment will depend upon the circumstances which are present. If there is a persistent sinus, lipiodol injection followed by x-ray pictures may reveal the source of the sinus. If it is a foreign body, it should be removed. If a tumor mass is found protruding through the abdominal wound, into the vagina or into

the rectum, the mass should be removed by incising these respective areas. If the foreign body is in the bladder it may sometimes be removed through the urethra, else the bladder will have to be incised. Foreign bodies discovered by roentgen ray pictures long after an operation was performed and which cannot be removed by a simple incision must be removed by a laparotomy as soon as the diagnosis is made. Even if a foreign body is accidentally discovered in a patient who has no abnormal symptoms, it should be removed because there is a great risk in leaving it in the abdomen.

CONCLUSIONS

In spite of the relatively few case reports in the literature of foreign bodies left in the abdomen after operation, an appalling number of such cases occur each year. While in an occasional case, the condition seems to be unavoidable, in the vast majority of cases it is due to negligence of either the surgeon or more particularly a nurse. The condition is serious because in the present series of 109 cases which I collected, including three cases which came under my own observation, there was a mortality of at least 17.4 per cent. Most of the foreign bodies left in the abdomen were gauze sponges or pads (52.2 per cent) and next in frequency were artery forceps (34.9 per cent). The foreign bodies were detected during a subsequent operation in 80 per cent of the cases, they were expelled spontaneously in 13.8 per cent, and they were discovered accidentally at autopsy in 4.6 per cent. In this paper the etiology, pathology, symptomatology, prognosis, prophylaxis and treatment of foreign bodies are discussed.

185 North Wabash Avenue.

ABSTRACT OF DISCUSSION

DR. JAMES W. KENNEDY, Philadelphia, Pa.—We give as a solution for the problem the simplest possible technic of which the surgeon may become the master. We work with three gauze towels and three gauze sponges and one assistant. This very small number of gauze towels and sponges is placed in two basins and it is easy for the surgeon to inspect the three gauze towels and sponges in each basin before and after the operation. No other piece of gauze is ever permitted to remain within the abdominal cavity.

SIGMOIDOUTERINE AND VESICOUTERINE FISTULA AS A COMPLICATION OF CHILDBIRTH*

WALTER C. G. KIRCHNER, M.D., ST. LOUIS, MO.

ALTHOUGH cases exhibiting uterine fistulas in association with childbirth occur very rarely, nevertheless, they deserve our earnest consideration, not only on account of the unfortunate plight in which the patient finds herself and the difficulty of treatment, but also because of the tendency of the cases at times to assume a medicolegal aspect.

Uterine fistulas have occurred as a result of accident or in the course of instrumental delivery, and also as a sequence of diseases involving the uterus, intestines, bladder or pelvic organs. However, it is with the idea of emphasizing the belief that intestinouterine and vesicouterine fistulas may occur spontaneously in the course of or as a result of a difficult labor, that I have been encouraged to present this paper. The problems as to the cause and the treatment of uterine fistulas associated with childbirth were brought home to me when cases of sigmoidouterine and vesicouterine fistulas were referred for treatment and operation, and an account of these cases may serve as a basis of argument and discussion. Brief recitals of the histories of these cases and comments on the reports of other cases are herewith reported.

SIGMOIDOUTERINE FISTULA

CASE 1.—The patient, Mrs. B., age thirty-six, of average stature and weight, was usually in good health and was able to attend to her household duties. Only meager information was obtainable concerning her first pregnancy; however, it was stated that the delivery of the child was difficult, forceps were used, and that the child was dead or died soon after birth. The patient became pregnant a second time, and when in labor a physician was called who found it necessary to resort to instrumental delivery. Craniotomy was performed and the uterus was emptied of its contents. The patient recovered and there were no unusual complications following the extraction of the child.

On March 16, 1913, four years after the birth of the second child, the patient, in labor for the third time, sent for her former physician. On arriving at the patient's home he learned that but little progress had been made, that the pains were ineffectual, and that the patient had become quite exhausted. At the examination it was found that the presenting head was high in the pelvis and, presumably, the bag of waters had ruptured some time previously, so that, in effect he was confronted with a dry labor. Instruments were employed to assist in the rotation of the head, and even after repeated application of forceps, the patient being anesthetized, it was found impossible to deliver the child. A consultant was called, and, the child being dead, craniotomy was performed. It was stated that this latter procedure was carefully done and that no undue injury was done to the soft parts while this operation was in progress. The patient recovered nicely from this operation, and on the following day, March 17, her

*Read at the Forty-Fifth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, French Lick Springs, Ind., September 12, 1932.

condition was very good. On March 18, the patient was feeling well and, without any warning, there was a sudden "explosion" and a considerable quantity of gas was passed through the vagina. Subsequently fecal matter was also passed through the vagina. On the two following days the condition remained unchanged. The patient had no great discomfort, and at no time was the temperature over 100° F.

A vaginal examination revealed that the discharge of fecal matter came from the cervix, though the location of the opening in the bowel was not discovered.

A proctologic examination was made and it was believed that the opening in the bowel was high up in the rectum. Practically all of the fecal matter was discharged through the vagina, very little if any stool passing through the anus. I saw the patient at the hospital and the following condition was found upon examination:

There was a fecal discharge from the vagina. All wounds of the vagina, such as follow delivery, were healed. Through the speculum it was noted that the external os was open, moderately lacerated, and that fecal matter came through the cervical canal. The cervix was adherent at the posterior portion. There was no pus; neither were there signs of inflammation. By digital examination the uterus was found slightly enlarged, adherent posteriorly at the cervical portion, though the fundus was slightly movable. The adnexa were free. The rectum was examined digitally and with the proctoscope, and even with the use of the sigmoidoscope I was unable to find the opening which communicated with the uterus. The character of the fecal matter indicated a fistula of the large bowel, and a tentative diagnosis of sigmoidouterine fistula was made and an operation for the cure or relief of the condition was recommended.

Operation.—It was decided to attack the fistula by the vaginal route, and by laparotomy if necessary. Ether anesthesia was administered. Through the posterior vaginal fold a dissection was made to expose the posterior wall of the cervix. The dissection was carried up as far as the fistulous tract which was loosened up and made as free as possible on all sides. The opening through the posterior vaginal wall also gave access to the culdesac of Douglas, and permitted digital examination of the abdominal portion of the fistula. Laparotomy was decided upon after a Fenger probe was inserted through the fistula into the intestine.

Laparotomy.—Left rectus incision. The uterus was somewhat enlarged and about the size of a man's fist. Tubes, ovaries and broad ligaments were normal but flaccid. The sigmoid flexure of the colon at a point a little below the middle portion was adherent to the uterus. There was no pelvic peritonitis and there were no adhesions aside from those taking part in the fistula. The condition resembled a lateral anastomosis of the sigmoid with the uterus, both loops of the bowel being free. The loop of sigmoid was dissected free from the lower portion of the uterus, and the opening in the bowel was closed with a double row of sutures. The opening in the uterus involved mostly the cervical portion, and this was closed, through the laparotomy opening, by means of deep and superficial sutures. A cigarette drain leading into the vagina was placed in the culdesac. There being no special complications, the abdominal wound was closed in layers. The patient was given the usual postoperative care.

Within one month all wounds were healed. The uterus was of nearly normal size, and movable. The cervix and external os were large and there was a slight thickening of the posterior part of the cervix where the repair had been made. Bowel movements and defecation were normal and painless. Menstruation was normal, and five years after the operation she was in good health.

A review of the literature revealed several additional cases which are briefly narrated for the sake of comparison.

Petit[13] had collected up to 1882, 18 cases of intestinouterine fistula which occurred as complications of pregnancy, but the manner in which these fistulas were produced was not always satisfactorily explained. Loenne[14] reports a case in which the woman

was in labor for nearly two days, the bag of waters rupturing at the end of the first day. When the pain grew less effective, the physician finally applied high forceps. A living child was delivered. On the third day there were signs of infection, the patient later becoming septic. There was pus in the stools. The patient died and at the autopsy two perforations were found in the cecum as well as a perforation in the posterior wall of the uterus. There were feces in the pelvis and a widespread peritonitis. He quoted Franque's case which was similar, there being likewise a perforation in the posterior wall of the uterus near the cervix.

In a case reported by Le Jemtel[12] a physician had been called in one and a half months after delivery when signs of infection had developed. He performed curettage and there was some improvement for a few days. The fever returned and shortly thereafter there was a discharge of feces through the cervix. The rectal opening closed spontaneously.

Graves[16] reported a case in which after forceps delivery there was a perforation of the fundus of the uterus and a prolapse of the small bowel into the vagina. The section of prolapsed bowel had been removed, but there was discharge of feces through the uterus and vagina. The integrity of the intestinal tract was reestablished and the patient made a satisfactory recovery.

Noecker[17] reported a case in which carcinoma of the cervix had been suspected and radium treatment had been instituted. Four months later the patient began to pass intestinal contents through the vagina. It was found that there was a perforation of the uterus which communicated with the lumen of the sigmoid and also with small bowel. A panhysterectomy was done.

Peraire[13] reports a case of intestinoutero-appendicular fistula which occurred subsequent to curettage, the latter being performed for a severe infection after a long and hard labor. Laparotomy was performed. The postoperative course was normal.

VESICOUTERINE FISTULA

Case 2.—The patient, Mrs. T., first presented herself for treatment in March, 1924, at which time she complained of bleeding from the rectum. She had the usual diseases of childhood. When she was five years old she had prolapse of the rectum for which condition an operation was performed when she was 15 years old. Menstruation which began during her seventeenth year has always been normal. She married at the age of 21 and has had two children. At the last childbirth there was a perineal laceration the repair of which had been deferred. Although the patient's general health was excellent, it was found upon examination that the bleeding from the bowel was due to the presence of a large number of rectal polyps. An operation was performed by the writer for the relief of this condition, and some seventy-five polyps of various sizes were removed by means of the actual cautery. The patient remained in good health but three years later a polyp 5 cm. in length was removed from the lower portion of the sigmoid.

Ten years after the birth of her last child the patient became pregnant for the third time, and the family physician was directed to take charge of the case. The patient worried a great deal while carrying the child and toward the latter months of pregnancy developed pronounced symptoms of hyperthyroidism. The abdominal muscles were greatly relaxed, and the patient having refused to wear an abdominal support, the abdomen became pendulous and the uterus assumed a position of antiflexion and sagged forward and downward. The family physician was thus confronted with serious complications at the time of delivery and the labor being tedious and difficult I was sent for in an emergency to take charge of the delivery.

Upon arrival at the patient's home I found that the patient was in a highly nervous state, the face was suffused, red and swollen, the heart action was rapid, there was a mitral murmur, the pulse rate 140 to 160 per minute, the patient was making frantic

physical efforts to bring about the expulsion of the child, the bag of waters had ruptured, the uterine contractions were active and forceful, the cervix was edematous and presented itself at the vulva and the head was firmly wedged in the pelvis.

A general anesthetic was administered and it was with great difficulty that the cervix was replaced behind the pubes to permit of proper dilatation and delivery. Low forceps were used to assist in the dislodgment and rotation of the head, and firm but careful traction was required to effect the delivery of the child. At no time did the instrument come in contact with any portion of the uterus or vagina adjacent to the bladder. An L.O.A. delivery of a large child was effected after some difficulty, however, the child was dead when born. A careful inspection of the passage was made

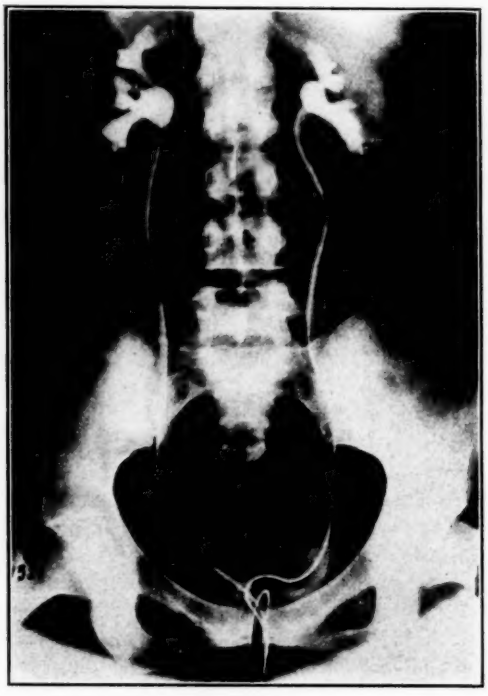

Fig. 1.—Pyelogram showing also loop of bougie inserted into bladder through vesicouterine fistula and emerging through vagina.

and there was no injury to the cervix or vagina which was apparent, nor laceration requiring repair.

The postpartum handling of the patient was left to the care of the attending physician and the course for the first three days was normal. On the fourth day the patient began to have difficulty in urination, and the bladder becoming distended, it was necessary to resort to catheterization. The bladder was catheterized daily and on the tenth day it became apparent that urine was coming from the vagina. By careful tests it was demonstrated that the urine was coming through the cervix. A retention catheter was placed in the bladder, and it was hoped that by keeping the bladder in a healthy condition and avoiding distention spontaneous closure of the fistula would take place. For two and a half months after delivery the patient received treatments directed to the cure of the vesicouterine fistula. Various solutions and injections were used without success and operative procedure for the cure of the fistula was advised.

The patient was referred to Dr. H. L. Custer for cystoscopic examination. About one-third the distance between the ureteral orifices, on the left and slightly below the interureteral fold, the opening of the fistula could be seen. A No. 3 F ureteral x-ray bougie was passed through the fistulous opening in the bladder, and the tip coming out through the vagina, it was ascertained that the fistula communicated with the cavity of the uterus. No. 5 F x-ray ureteral catheters were also passed into each ureter. Pyelograms and x-ray examinations showed both kidneys to be normal in size and position, and that low down in the bladder the small loop of the opaque catheter occupies the position of the vesicouterine fistula (Fig. 1).

Operation.—A bougie having been passed through the vesicouterine fistula as a guide, the patient was placed under general anesthesia. An ample transverse incision which included the outer layers, was made in the upper portion of the vagina and anterior to the cervix. With care and patience a wide dissection was made and the bladder was separated from the vagina and cervix as far as the fistulous tract. With the bougie in position, the fistulous tract was isolated and made free. It was necessary to incise the cervix longitudinally in order to remove the tract. The fistula entered the uterus just internal to the internal os of the cervix. Special effort was made to mobilize the bladder as extensively as advisable. The bougie having been removed, the fistula was tied off close to the bladder and removed. Fine catgut sutures were used for the mucosa in reinforcing the ligation. The layers of the bladder in the region of the fistula were deficient in parts, and extensive and tedious suturing was required in order to give proper support and protection to the bladder. Fine chromic catgut as continuous and interrupted sutures were used for this purpose, and special effort was made to avoid tension or strain on the sutures. It was only by adequate mobilization of the bladder that proper suturing could be accomplished. The uterus and cervix were repaired by suturing, bearing in mind the restoration of the cervical canal. The cervix, which had been badly lacerated by the previous childbirths, and also flaps of the vaginal wall were utilized in giving support and protection to the denuded portion of the bladder. After the operation for repair, which was tedious, painstaking and consumed much time was completed, a good-sized retention catheter was placed in the bladder and secured by means of strips of adhesive plaster. A small catheter was inserted well up into the vagina and this was also secured to the outer parts by means of adhesive plaster. Through this catheter a small amount of mercurochrome solution was instilled into the vagina. The patient, though somewhat exhausted by the duration of the operation, was returned to the bed in a satisfactory condition.

Postoperative Course.—For the first three days following the operation the temperature was elevated but after the fourth day the course was uneventful.

The free end of the retention catheter which was secured in the bladder was placed in a sterilized urinal or bottle and continuous catheterization being thus provided for, the bladder was kept empty and the slightest tension was thus relieved. At regular intervals small quantities of argyrol were instilled into the bladder through the retention catheter. In the same manner mercurochrome solution was instilled into the vagina through the catheter which had been secured in the vagina. No special pads or dressings were placed over the vulva. The requirements for the postoperative handling though exacting were simple and no special nursing was required. At the end of the second week a quantity of argyrol solution was allowed to remain in the bladder, and it was definitely determined that there was no leakage into the vagina. The vaginal wounds had also shown satisfactory healing. By plugging the end of the retention catheter, urine was permitted to remain in the bladder. At the beginning of this procedure the stopper was removed each hour and the interval was gradually increased to three hours and longer.

In the meantime the patient was permitted to get out of bed, the catheter still re-

maining in the bladder. The patient left the hospital at the end of the third week at which time there was no leakage and the bladder had been tested to hold more than ten ounces of urine. A satisfactory and complete cure of the vesicouterine fistula was accomplished.

While a review of the literature has shown that the occurrence of vesicouterine fistula is rare, nevertheless, it is important that this condition be borne in mind as one of the complications associated with childbirth.

Conaway[23] reported a case of vesicouterovaginal fistula and rectovaginal fistula which followed the delivery of a seven pound baby. Forceps were used and a slight laceration of the pelvic floor was promptly repaired. A few days later the patient noticed that she was unable to urinate and that the urine dribbled almost constantly and there was an odor of fecal matter about the vagina. Examination disclosed a vesicouterovaginal and a rectovaginal fistula. An operation was performed and a complete cure of both fistulas was established.

Luke[30] was able to cure a case of uterovesical fistula by "hystero-ostio-cleisis."

Rubins[33] reported a case of uterovesical fistula that had resulted after childbirth where there was apparently much sloughing of tissue. The woman subsequently became pregnant and the complications which resulted during the seventh month of gestation were such as to cause a septicemia from which the patient died.

A case of spontaneous healing in a vesicouterine fistula following labor was reported by Sims.[35] The patient had been in labor for sixty hours, the membrane had ruptured and an ampule of pituitary extract had been administered which gave rise to intense pain. Version was resorted to and an 8 pound 14 ounce baby was delivered. On the morning of the fifth day the patient complained of inability to hold the urine. On testing the bladder with a solution of methylene blue it was found that a small stream of the solution came from the cervical os. Following catheterization and irrigation of the bladder, a silver iodide preparation was instilled, and four weeks later the fistula was healed.

In a presentation of the subject of bladder fistulas Schmitz[34] narrates a case of vesicouterine fistula that had resulted from a violent curettage when the uterus was in a septic condition. At operation the bladder was dissected from an elongated wound in the body of the uterus. Healing without leakage took place. Hess[27] reported a case of unilateral fused kidney with uterovesical fistula which latter condition had developed shortly after delivery.

From a review of the literature it is evident that intestinouterine and vesicouterine fistulas may occur spontaneously and also as the result of trauma. The fistulas may be associated with (a) the nonpregnant uterus or with the uterus unassociated with active labor at term, or also (b) with the pregnant uterus at term.

In the first instance the causative factors may operate from the uterus to the intestine or bladder, or the process may originate in the intestine or bladder and proceed and involve the uterus. Trauma of the uterus such as may be caused by the curette or other instruments, diseases and inflammations of the uterus, namely cancer and tuberculosis, and also processes following in the course of x-ray treatments; inflammatory diseases of the bowel and bladder, and other diseases of the bowel and bladder such as cancer and tuberculosis, any of the conditions enumerated may be factors in the production of intestinouterine or vesicouterine fistula.

In association with pregnancy at or near term, these fistulas may be the result of perforation of the uterus due to instrumentation such as might occur with forceps delivery, craniotomy, curettage, etc., or to perforation of the uterus following a difficult spontaneous delivery. Perforation of spontaneous origin may be the result of a prolonged labor with impaction of the head of the child against the promontory of the sacrum in which instance the bowel may be interposed between the uterus and the promontory, or against the symphysis pubes with interposition of the bladder.

It may be observed that in many of the cases associated with pregnancy, the complication has occurred in multipara, that the child was large and well developed and often above average size, that usually the head presented, and that there was often some modification of the normal factors which are present and which function during the descent and rotation of the head. These factors may be influenced by such conditions as pendulous abdomen, previous cervical and perineal laceration, perineal relaxation, tumors, character and force of uterine contractions (at times unfavorably influenced by pituitary preparations) and a number of other conditions. The head when once impacted makes spontaneous delivery difficult or impossible. A case which apparently offers a favorable prognosis may unexpectedly be converted into a difficult case when the head becomes impacted.

An impacted head is apt to produce necrosis at the site of greatest impaction. It seems plausible that if the greatest force is applied to the uterus between the child's head and the promontory of the sacrum, then if the force and pressure is exerted beyond a certain point, the uterine wall becomes damaged, necrosis gradually takes place and ultimately perforation may take place. It may be possible to have such perforations take place with ultimate healing and with no untoward results. However, if perchance at the time of such impaction a loop of intestine has become interposed between the promontory of the sacrum and the uterus, it is evident that a necrosis of the wall of the bowel as well as of the uterus may take place. The intestinal trauma may be sufficient and may be prolonged enough to permit agglutination of bowel to uterus (the irritated peritoneum readily produces a plastic exudate), so that by the time when necrosis and perforation take place, the lumen of the bowel and the cavity of the uterus may be thus permanently connected even without an extensive peritoneal infection taking place. This is what had happened in one of our cases, the report of which accompanies this paper. In another instance the force of the impaction may be exerted against the ventral side of the symphysis pubis, and this is prone to happen when the uterus has descended abnormally or when the cervix is abnormally long. The condition is usually complicated by a prolapse and edema of the anterior lip of the cervix. The edema makes it difficult to replace the

cervix to its proper position in the pelvis. At the time of the descent of the head, the prolapse also causes a descent of the bladder which becomes interposed between the uterus and the symphysis. When the pressure is exerted to the extent of producing necrosis of the uterine wall, the bladder is very apt to become involved and when perforation takes place a vesicouterine fistula results. An instance of this sort is reported in our second case.

While instrumentation is frequently resorted to on account of the impaction and therefore difficult labor, the instrument may not necessarily be the cause of the trauma and fistula. It is rather the prolonged force and pressure exerted locally by the descending head against the symphysis or promontory that is the cause of these fistulas, which may occur in cases where the labor is difficult, and is occasioned by the impaction with impingement of the head at the site of the promontory of the sacrum or the symphysis pubis.

While it is plausible to expect necrosis and perforation of the uterus to occur in the difficult cases with impaction of the head of the child, nevertheless, uterine fistula associated with bladder or bowel following labor and not directly the result of instrumentation are very rare.

At the St. Louis City Hospital where there are some 1875 obstetric cases treated annually, there is no record of intestinouterine or vesicouterine fistula having occurred. The textbooks on obstetrics do not mention these types of fistula. In a search of the literature it was found that the occurrence of these fistulas is rare and that in most of the recorded cases the fistulas are the result of disease and only very rarely has the fistula resulted in cases following labor.

Bearing in mind the factors involved in the formation of spontaneous fistulas, it is not unlikely that many so-called cases of enuresis paralytica are due to fistula formation and that spontaneous healing causes them to disappear. As the cause of these fistulas associated with labor becomes more apparent, it is likely that more cases will be reported and that better statistical information will be at hand.

In trying to prevent the complication due to these fistulas, it is important to recognize the observation that any abnormal condition associated with labor is a potential factor in producing impaction of the head as it passes through the parturient canal. Control of the case so as to prevent precipitate labor, dry labor, abnormal uterine contractions, prolonged labor, abnormal position of child, etc., will also help to prevent complications which result in fistula formation.

The necessity for the correction of lacerations following labor is apparent as a prophylactic measure. Proper care should be exercised in the administration of pituitary extract. When labor is prolonged and the head is engaged in such manner as to produce localized pressure, proper measures should be instituted to hasten the delivery.

The diagnosis of uterine fistula is usually not difficult. Careful inspection is essential. In the case of intestinal fistula, the character of the fecal discharge, the results of proctoscopic examination, information gained by the use of rectal injections and x-ray examinations are important in establishing a diagnosis. The diagnosis of a urinary fistula is aided or established by cystoscopic examination. Colored solution instilled into the bladder often helps to locate the position and nature of the fistula. When it is possible to pass a probe or bougie the diagnosis may be absolutely established. As previously mentioned, spontaneous healing of the fistula may take place. However, if the fistula has persisted for some time the tract has become organized and thus established and nothing short of operative interference will accomplish a cure.

Intestinouterine fistula is best treated by abdominal section which permits of proper inspection and affords greater room for manipulation and repair. Great skill in operating may be required to meet the conditions requiring correction. It may also be necessary to resort to the combined treatment in which operation through the vaginal route and laparotomy are required to effect a satisfactory cure. It is essential that cases of intestinouterine fistulas have proper preoperative preparation so that failure of the operation on this account may be avoided.

The preoperative care in cases of vesicouterine fistula is also very important. Certain fistulas have been healed by installation of silver preparations into the bladder or cauterization of the fistulous tract when this is possible. It is important to relieve the bladder of any tension due to the collection of urine, and the retention catheter placed in the bladder should be used. When the fistulous tract is not too large cure has been effected by means of electrocoagulation. Gottlieb[26] cured a case by passing an electrode through the cystoscope and into the fistulous opening as far as it would go. The tract was then coagulated in its entirety by slowly withdrawing the electrode with the current on. Fresh granulations gradually fill in the tract and a cure is established.

In those cases in which the tract is well established the decision must be made as to whether the approach should be made transperitoneally or by the vaginal route. In most instances the repair can be made from below unless the fistula is located high on the bladder wall. The operator should have complete information as to the character, size and location of the fistulous tract. Cystoscopic examination and the passage of a bougie along the tract furnishes useful information and is a great aid to the operator. Szendy and Szendy[36] have worked out an elaborate plan for the handling of vesicouterine and vesicovaginal fistulas. It must be evident, however, that no two cases are alike and that the outcome depends upon the resourcefulness of the operator. In order to meet with success in the cure of the fistula it is most essential that the bladder in the region of the tract be freely mobilized. In order to accomplish this, tedious and

painstaking dissection is required. The opening in the bladder is best closed by suture, interrupted, continuous or purse-string, using fine plain catgut. The opening must be reinforced by one or two rows of interrupted or continuous suture lines using catgut which is not so readily absorbed. It is very important that tension on the sutures be avoided, and if possible the suture lines should not be placed over each other. The repair of the uterus and the vagina must be accomplished according to the special indications. The writer has found installation of a nonirritating antiseptic solution into the vagina of value when doing plastic operations about the genitalia. In order to prevent the accumulation of urine in the bladder and to facilitate treatment, a retention catheter is placed through the urethra and secured. The catheter is worn until there is assurance that the fistula has been cured.

COMMENT

Intestinouterine and vesicouterine fistulas as complications of labor are rare and they may be spontaneous in origin.

Factors that are responsible for the production of variations from the normal mechanism of labor are prone to precipitate complications that may result in the production of uterine fistulas.

In prolonged labor if impaction of the head takes place, uterine fistulas may develop.

Spontaneous cures of vesicouterine fistulas have been reported.

Electrocoagulation in the treatment of uterine fistulas is worthy of trial.

In the surgical treatment of vesicouterine fistulas it is essential that the bladder be freely mobilized, that tension on sutures be avoided and that the bladder be kept empty by the use of retention catheter until healing of the fistula is completed.

1515 Lafayette Avenue.

REFERENCES

Intestinouterine Fistula

(1) *Amann, J. A., Jr.:* Verhandl. d. deutsch. Gesellsch. f. Gynäk. **8**: 463, 1899. (2) *Ahumada, J. C., and Chevalier, R.:* Bol. Soc. de obst. y ginec. **8**: 288-293, 1929. (3) *Baldwin, A.:* Proc. Roy. Soc. Med. London, 1913-14, **7**: Surg. Sec. 71. (4) *Bernd, L. H.:* J. A. M. A. **45**: 465, 1905. (5) *Bernd, L. H.:* Proc. Philadelphia County Med. Soc. **26**: 288, 1905-6. (6) *Bidder, A.:* Verhandl. d. deutsch. Gesellsch. f. Chir., 1885, XIV pt. 2, 52. (7) *Cursham, G.:* London Med. Gaz. **23**: 943, 1834. (8) *Demarquay:* Gaz. Med. de Paris **22**: 341, 1867. (9) *Einbeck, A. T.:* St. Louis Cour. Med. **4**: 122, 1880. (10) *Graves, W. P.:* Am. J. Obst., N. Y. **57**: 353, 1908. (11) *Hamon:* Rev. med. chir. d. mal. d. femmes, Paris **7**: 455, 1885. (12) *Huet, Ch.:* Pres med. belge, Brux. **64**: 126, 1912. (13) *Le Jemtel:* Bull. et mem. Soc. de chir. de Paris, n.s. **34**: 845, 1908. (14) *Loenne, F.:* München med. Wehnschr. **65**: 1135, 1918. (15) *Moir, C.:* Internat. J. Surg. **31**: 263, 1918. (16) *Newgebauer, F. L.:* Rev. de gynec. et de chir. abd., Paris **2**: 581, 1898. (17) *Noecker, C. B.:* Penn. M. J. **32**: 496, 1929. (18) *Peraire:* Paris, Chirurg. **3**: 823, 1911; idem., Gynecologie, Paris, 1912. (19) *Petit, L. H.:* Ann. de gynec., Paris **18**: 401, 1882; **19**: 14, 1883. (20) *Schenck, W. L.:* Tr. M. Soc. Kansas, Lawrence **13**: 102, 1879.

Vesicouterine Fistula

(21) *Brodhead, G. L.:* M. Rec. **98**: 437, 1920. (22) *Clemente, D.:* Policlinco (sez prat.) **38**: 113-116, 1931. (23) *Conaway, W. P.:* J. Med. Soc. New Jersey **13**: 401, 1916. (24) *Dombier, M.:* Paris Chir. **40**: 80, 1922. (25) *Gaume:* Paris Chir. **13**: 272, 1921. (26) *Gottlieb, J.:* Zentralbl. f. Gynäk. **54**: 1090-1092, 1930. (27) *Hess, E.:* Atlantic M. J. **29**: 780-782, 1926. (28) *Jonquan:* Paris Chir. 1909. (29) *Lavenant and Nagel:* Paris Chir. **75**: 1133-1290, 1916. (30) *Luke, F. R.:* J. M. Assn. of S. Africa, May 24, 1930. (31) *Noecker, C. B.:* Penn. M. J. **32**: 496, 1929. (32) *Rolando, S.:* Folia Gynaec. **23**: 443-448, 1926. (33) *Rubins, A.:* Brit. M. J. **1**: 97, 1926. (34) *Schmitz, E. F.:* Gyn. and Obst., Surgical Clinics of N. Amer. **5**: 1345, 1925. (35) *Sims, G. K.:* J. A. M. A. **90**: 759, 1928. (36) *Szendy, A., and E.:* Zentralbl. f. Gynäk. **53**: 540-543, 1929. (37) *von Thompson, H.:* Zentralbl. f. Gynäk. **48**: 2566-2568, 1924. (38) *Verstraeten, C.:* Observation de Fistula Vesicouterine Guerie Spontanement, Am. Soc. de Med. de Gand. **54**: 106, 1876. (39) *Zweifel, P.:* Monatschr. f. Geburtsh. u. Gynäk. **53**: 3, 1920.

ABSTRACT OF DISCUSSION

DR. H. M. N. WYNNE, MINNEAPOLIS, MINN.—In reviewing the literature on this subject I have been impressed with the number of deliveries by high forceps operations which have been followed by uterovesical fistulas. Fistulas developing immediately after delivery are due to tears while those developing after a period of several days are due to pressure necrosis.

In the examination of patients suffering from urinary fistulae the knee chest position is of great value.

Surgical repair by the vaginal route may be facilitated and made easier by the use of the Schuchardt incision. However, I believe that a more satisfactory closure can be made in the majority of cases by thorough mobilization of the bladder wall at the site of the fistula. The cure of fistulas by electrocoagulation is necessarily limited to small openings. The suprapubic operation is necessary in certain cases for adequate exposure and mobilization of the bladder.

We know that a considerable number of these fistulas have healed spontaneously. Unless a very large fistula is present, it would seem advisable to place a retention catheter in the bladder at once and give nature a chance.

In the preparation for operative closure of a sigmoidouterine fistula it may be advisable to divert the fecal current by colostomy as a preliminary measure. A large rubber tube passed through the anus above the site of the closed fistula in the bowel and allowed to remain for several days will be found of value in some cases.

DR. KIRCHNER (closing).—There are a number of these cases reported of fistula resulting from disease or from trauma. My object in presenting this paper in this way was to encourage surgeons to report their cases and to relieve us from the possibility of damage suits by giving this information. I do not believe that every case of fistula is necessarily the fault of the obstetrician. In these two cases reported the families of the patients were making preparation for damage suits. This paper was written more with the object of calling attention to the spontaneous cases than anything else.

In regard to the treatment, it should be borne in mind that the principle of mobilization of the bladder is very important. I have had occasion to reoperate on cases of vesicovaginal fistula and in those cases where mobilization of the bladder was properly done cures were obtained. Where the bladder was not mobilized, failures resulted.

MULTIPLE DERMOIDS OF THE OVARY*

JAMES RAGLAN MILLER, M.D., HARTFORD, CONN.

IT IS the purpose of this paper to review the experience with dermoid cysts of the ovary at the Hartford Hospital from 1916 to 1932, to emphasize the necessity of conservative surgery in view of the frequency of bilateral involvement, and to review briefly the literature.

Lebert[1] and Pauly[1] were able to collect 108 instances of bilateral dermoid cysts up to 1875. R. Loewy and P. Gueniot[2] collected 88 additional cases up to 1902. The latter authors gave the frequency as 20 in 117 where the second ovary was similarly involved, and they, as well as subsequent writers, reported no particular effect on menstruation or on pregnancy. They advised conservation of tissue by resection of the tumor only where possible. They thought the diagnosis of dermoid cysts was seldom made, and of bilateral dermoids almost never made before operation. They urged careful examination of the second ovary at operation.

Table I shows some of the larger series in which the frequency of bilateral dermoids is reported:

TABLE I

	DERMOIDS	BILATERAL	PER CENT
R. Loewy and P. Gueniot[2]	117	20	
W. Rosenstein,[3] from literature			10-40
G. Van S. Smith[4]	97	5	
S. A. Chalfont[5]	16	2	
J. M. Marshall[6]	415	63	15.4
Gardiner[7]	24	2	
Fleming[7]	20	1	
Lochrane and Keating[7]	22	6	
Mandelstamm[8]			14
Steuber and Brandess[8]			18.5
Kusudo Shogi[8]			15.9
August Mayer[9]			18.4
Lippert[10]			10.61
Glockner[10]			11
Ravano[10]			13.6
Gebhardt[10]			17.58
Ikeda[10]			25.4
Satow[10]			31.17
Mantel[10]			40
Present series	90	22	25

W. Blair Bell[11] says, "Few surgeons give any consideration to the surgical treatment of innocent neoplasms other than the complete removal of the organ. . . . . As a rule some healthy portion of ovary can be preserved with its normal connections for nearly every neoplasm tends to grow away from the hilum, and the preservation of this, with adjacent ovarian tissue leaves well nourished and functional tissue."

Frank S. Matthews[12] emphasizes the wisdom of conserving ovarian tissue in the presence of pregnancy. The line of cleavage between cyst and ovarian tissue is easily followed. He reports six cases of bilateral dermoids of which four were associated with pregnancy. Enucleation of the dermoids was practiced in all but one case. Preg-

*Read at the Forty-Fifth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, French Lick Springs, Ind., September 12, 13, and 14, 1932.

nancy continued in two where corpora lutea were removed at the second and fifth months of gestation.

Eisenstädter[13] found three cancers in 13 dermoids; Lippert[10] believed cancers occurred in 3 per cent of dermoids; Hoehner[14] found three cancers in 7 dermoids; Wilms[14] states the belief that malignant growths are found more frequently in bilateral than in single dermoids.

Masson and Ochsenhirt[15] reviewed 33 cases of squamous cell cancer originating in dermoids and added 3 new cases. They put the frequency of such changes at from 0.5 to 5 per cent of all dermoids, urging careful microscopic examination of all dermoid cysts. Rohdenburg[16] found 6 malignancies among 61 dermoids.

Marshall,[6] in a brief report, presented what is perhaps the largest number of dermoid cysts ever reported from a single clinic (Mayo up to 1928). The outstanding features of this report are as follows:

There were 415 dermoid cysts representing 4 to 5 per cent of all ovarian tumors removed. There were 60 per cent between thirty and fifty years of age, the greatest age incidence being thirty-eight years. Twelve per cent had twisted pedicles, 15 per cent involved both ovaries, 4 per cent were infected, 1 per cent gangrenous, 1.9 per cent malignant. The dermoid cyst was an incidental finding in 32 per cent. There were 225 out of 285 married patients who had had one or more pregnancies. In none was a definite preoperative diagnosis made.

G. Van S. Smith[4] reported no malignant degeneration found in 97 dermoids. In 29 per cent the finding was incidental. He advises conservation of ovarian tissue if possible.

Von Franque[17] gives the incidence of dermoids as about 10 per cent of all ovarian tumors and states that they are often bilateral, cancer developing in 3 per cent of dermoids.

Joseph Novak[18] reported a patient who showed 10 dermoids in one ovary and 11 in the other.

August Mayer[9] puts carcinomatous degeneration of dermoids at 4½ per cent. He questions W. A. Freund's statement that hypoplasia of the genital apparatus is a fairly frequent accompanying sign of dermoid tumors of the ovary. Mayer was able to find this in only 4 per cent. Freund also spoke of the predilection of dermoid cysts for the anterior culdesac.

Lochrane and Keating[7] reported cancer in 2 out of 6 bilateral dermoids.

During the past sixteen years at the Hartford Hospital, up to August 1, 1932, we have observed 90 patients with dermoid cysts of the ovary, this number including patients of all physicians. Of these I have operated personally upon 22; this is a larger number than I should have expected as my share. When I noted therefore one of the histories in which one dermoid was removed followed by the removal of the other one year later, without a note of the condition of the remaining ovary at the first operation, I wondered if some instances were not overlooked. Of the 12 cases where dermoids complicated pregnancy, I found that 9 were my own, and that I had assisted with two others.

In a large general hospital where cross indexing of diagnoses is less perfectly done in the earlier years than in some of our teaching hospitals, it frequently happens that this diagnosis is not recorded, for it may be an incidental and unimportant fourth or fifth complication in the case. Some surgeons are satisfied with gross inspection of the tumor, thereby

saving the patient a laboratory fee, and in this regard the present series is not thoroughly checked.

In addition to consulting the hospital cross index of diagnoses, I have collected from the operating room records and from the laboratory a large number of added cases. Such an experience probably can be duplicated in most general hospitals. I believe, however, that the list is fairly complete.

Of the 90 patients having dermoid cysts, 12 were complicated by pregnancy, one bilateral dermoid died of peritonitis, following accidental injury of the small bowel; 12 had twisted pedicles; 22 involved both ovaries. In all, 6 cases had more than two dermoids, the largest number being 4 on one side and 2 on the other. Three incomplete operations were known to have been done, one of these having been referred to. The second patient was pregnant in the second month, and the dermoid in the ovary which contained the corpus luteum was not removed for fear of disturbing pregnancy. This patient however, aborted two weeks later. The third patient was my own in whom a small dermoid, 2 cm. in diameter, was found incidental to a complete removal of the pelvic organs. I had operated on this patient eight years previously, and a detailed note described the other ovary as entirely normal in appearance.

Of the 12 cases complicated by pregnancy, 6 patients were delivered at term by cesarean section, 4 because of blockage in the pelvis. In one of these I made a positive diagnosis substantiated by x-ray at the third month, and the cesarean section was done at the patient's request, she being thirty-nine years old in her first pregnancy. In one case the dermoid was adherent in the culdesac and was removed at a subsequent operation. In the other two the cesarean section was done for other reasons and the dermoid cyst was an incidental finding. In the 6 cases where pregnancy had advanced to the sixth to twelfth week, one came to the hospital infected with a criminal abortion. The broad ligament abscess which resulted was drained above Poupart's ligament, and I unfortunately punctured the dermoid cavity as well. After many weeks the adnexa on this side were resected successfully and the patient later became pregnant. In one case previously mentioned abortion occurred following operation, in another the outcome was not known, and in 3 I was able to deliver a live baby.

One of these cases is worthy of more detailed mention: A Danish woman, aged twenty, six weeks pregnant, had an acute attack of right-sided pain. Diagnosis of early pregnancy and twisted ovarian cyst was made and operation promptly performed. The right ovary was a twisted, fist-sized dermoid and had to be removed entire. The uterus was anteflexed and six weeks pregnant, the corpus luteum in the left ovary lying between two dermoid cysts 2 by 3 by 4 cm. and 3 by 4 by 5 cm. respectively. At first glance, complete removal of the left ovary seemed necessary but

the cysts were carefully enucleated, suturing the cut edges of ovarian tissue adjacent to the corpus luteum with plain catgut on an intestinal needle. This patient went to term and has menstruated regularly for more than a year.

A twenty-year-old pupil nurse having a basal metabolism 20 to 30 below normal was operated upon because of bilateral abdominal tumors; one ovary containing four dermoids was removed entire; in the other the corpus luteum was located between two dermoid cysts which were enucleated as in the previous case. This patient has menstruated regularly for several months.

The preoperative diagnosis of dermoid cysts has been made on several occasions and of a twisted dermoid once, confirmed by operation.

In a recent case I made a preoperative diagnosis of bilateral dermoids of the ovary which proved to be correct. I was unable to resort to x-ray examination in this case, but was led to the diagnosis by the following considerations: One of the cysts lay in the anterior culdesac. This patient, aged twenty-four, had always menstruated irregularly, infrequently, and scantily, and the presence of a high-grade funnel pelvis suggested the possibility of abnormal developmental growths although there is probably scant basis for this conjecture. This patient was treated in a similar conservative way and is now menstruating regularly for the first time in her life. This case appears to refute the older teaching that dermoids have no influence on menstruation.

Of the 22 patients who had bilateral involvement, three had more than one dermoid in the other ovary, and two were complicated by pregnancy. The age distribution shows that 12 of the 22 were under thirty-one years and 17 were under forty-one years of age. This frequency of bilateral involvement during the childbearing period emphasizes the necessity for considering conservation of ovarian tissue.

In this series no case of malignancy arising in the dermoid cyst was noted. About 80 per cent of the dermoids were examined by the pathologist.

SUMMARY AND CONCLUSION

1. Dermoid cysts were found in both ovaries in 25 per cent of 90 cases and more than one dermoid in a single ovary were found in 7 per cent. This frequency demands careful inspection of both ovaries before deciding what to do.

2. Conservation of ovarian tissue by enucleating the dermoid cyst is an easy and valuable procedure when operating on a woman in the childbearing period; this may be carried out during pregnancy with little added risk.

3. The practice of relying on a gross examination is mentioned merely to condemn it, for malignancy arising in a dermoid occurs frequently enough to warrant careful microscopic examination in every case.

REFERENCES

(1) *Lebert and Pauly:* Quoted by Loewy and Gueniot. (2) *Loewy, R., and Gueniot, P.:* Rev. de Gynec. et de chir. abdom. **6**: 246, 1902. (3) *Rosenstein, W.:* Monatschr. f. Geburtsh. u. Gynäk. **78**: 302, **18**: 666, 1928. (4) *Smith, G. Van S.:* Am. J. Obst. & Gynec. **18**: 666, 1929. (5) *Chalfant, S. A.:* Penn. M. J. **34**: 537, 1931. (6) *Marshall, J. M.:* Reports of Staff Meetings of the Mayo Clinic **3**: 4, 1928. (7) *Gardner:* J. Obst. & Gynec. Brit. Emp. **38**: 333, 1931. (7) *Fleming:* J. Obst. & Gynec. Brit. Emp. **38**: 280, 1931. (7) *Lochrane and Keating:* J. Obst. & Gynec. Brit. Emp. Summer 1931. (8) *Mandelstamm, Stueber and Brandess, Kusudo Shogi:* Quoted by Fleming. (9) *Mayer, August:* Halban & Seitz Biol. u. Path. des Weibes **5**: 859. (10) *Lippert, Glockner, Ravano, Gebhardt, Ikeda, Satow, Mantel:* Quoted by Mayer. (11) *Bell, W. Blair:* Am. J. Cancer **16**: No. 1, 1932. (12) *Matthews, Frank S.:* Ann. Surg. **82**: 483-485, 1925. (13) *Eisenstädter:* Monatschr. f. Geburtsh. u. Gynäk. **54**: 360, 1921. (14) *Hoehner, Wilms:* Quoted by Eisenstädter. (15) *Masson and Ochsenhirt:* Surg. Gynec. Obst. **48**: 702-708, 1929. (16) *Rohdenburg:* J. Lab. & Clin. Med. **12**: 211, 1926. (17) *von Franque:* Menge & Opitz Handbuch der Frauenheilkunde, 1913. (18) *Novak, Joseph:* Beitr. z. Path. Anat. u. z. Path. **14**: 1-37, 1909.

179 Allyn Street.

ABSTRACT OF DISCUSSION

DR. WILLIAM H. WEIR, Cleveland, Ohio.—Our material has been relatively limited. We do not seem to see dermoids very frequently. I have never encountered a dermoid showing malignancy, although in one case it was suspected, but the suspicious area proved to be well defined thyroid tissue. Generally they enlarge slowly by a gradual accumulation of the secretions from the skin in the interior of the cyst. It has been my practice, when encountering so-called polycystic ovaries, to puncture the numerous follicle cysts when the ovaries are to be conserved. On one occasion the contents of one cyst showed that it was a typical but very tiny dermoid. In another case the thick mucous fluid exuding from a cyst about 1 cm. in diameter showed that it was not a follicle and microscopic examination proved it to be a pseudomucinous adenocystoma. There is a decided tendency for dermoids to become necrotic and one must be very careful in palpating such cysts before packing off the abdomen, lest they rupture. On one occasion this happened with a huge dermoid reaching above the navel. Suddenly it ruptured wide open, flooding the whole abdomen with a mixture of hair, sweat, and sebaceous material, and I had difficulty cleaning up with gallons of fluid. The patient fortunately recovered but after a very stormy convalescence. Dermoids should be removed without preliminary tapping as the hair and sebaceous material will usually clog the cannula.

DR. JAMES E. DAVIS, Ann Arbor, Mich.—There is a characteristic familial feature in a certain percentage of these cases. In certain cases all of the women will have dermoids.

Another point in the diagnosis of dermoids is that very often the macroscopic is better than the microscopic examination because, the tissues may show a total destruction of the epidermoid units but macroscopically the units can be easily recognized.

DR. EDWARD J. ILL, Newark, N. J.—The inclusion theory of Cohnheim as a cause for the existence of dermoids has never appealed to me. Many years ago I came across Regier's suggestion that the tumor he described, containing almost an entire skeleton, was of parthenogenetic origin. This appealed to me. Later Pfannenstiel, found that segmentation of the unfertilized ovum took place. Soon after that an American article appeared in which it was claimed that sixteen thousand serial sections of the ovary of the unfertilized guinea pig would show that such segmentation really takes place. It immediately occurred to me that here was an explanation of the reason for the production of dermoids of the ovary. It also would explain why we may find two or three dermoids in an ovary at the same time.

PROLAPSE OF THE UTERUS*

W. A. Coventry, M.D., and Russell J. Moe, M.D., Duluth, Minn.

(From the Duluth Clinic)

PROLAPSE of the uterus has always presented to the gynecologist an interesting problem because of the many factors involved in its causation and also in the methods to be pursued to correct the deformity that has taken place. In our series we have been particularly pleased because of the large percentage of cases in which we have been able to give complete relief to the patient.

In our series a larger percentage were due to the use of forceps in the hands of the average practitioner; a smaller percentage of patients with prolapse were confined in the home or had been confined by midwives, but practically all cases had had lacerations which had not been repaired. We have encountered only one case in a virgin, and in this case we attibuted the prolapse entirely to atrophic conditions of the muscles of the pelvic floor. We have found too that the incidence of prolapse is much greater in that type of patient who has had to work hard in the home or on the farm, where the increased intraabdominal pressure accompanying this type of work is a factor in the causation of prolapse.

In determining the type of operation to be performed, the degree of prolapse is of considerable importance. The age of the patient is important also. Is the patient young? Is she in the childbearing age? Is she near or past the menopause? Is there a cystocele, rectocele, or both? Is the uterus small, atrophic, or is it of normal size? Is there marked prolongation of the cervix; is there ulceration of the cervix? Are there fibroids or are there adhesions binding the uterus? Is there a true hernia of the vault of the vagina? Have the muscles lost their tone?

The more experience one gains from treating cases of prolapse, the more one is impressed with the fact that the evaluation of these many factors is of extreme importance. We have seen a diagnosis of prolapse of the uterus made when it really was a true hernia of the vault of the vagina. We have seen it made when there was a large rectocele and the uterus decidedly fixed and in good position. We have seen it where there was a large cystocele bulging into the vulva. These errors, of course, are only made by those who are careless and who do not take the time to evaluate the exact picture that presents itself to the one making the diagnosis.

On the careful evaluation of these many diagnostic points depends exactly the type of operation that should be performed. In this paper, however, we shall consider only that type of case in which there is a second and third degree prolapse of the uterus with or without cystocele or rectocele.

---

*Read at the Forty-Fifth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, French Lick Springs, Ind., September 12, 13, and 14, 1932.

The literature is abundant with types of operations to be performed. In our opinion, any type of abdominal fixation of the uterus for prolapse should not be performed. In vaginal operations the morbidity and mortality are very markedly decreased over the abdominal route. We have seen many bad results from supravaginal hysterectomy, fixation of the uterus to the anterior abdominal wall, splitting the uterus and burying it in the abdominal wall, until now we are firm converts to the interposition operation as being the operation of choice for prolapse of the uterus. We are fully aware of the fact that in England the Manchester type is generally performed.

There are two types of interposition operation which we prefer: the Wertheim-Watkins and the Mayo vaginal hysterectomy modification. In the Wertheim-Watkins operation the uterus should be large enough to be interposed between the vaginal wall and the bladder so as to make a true wedge and firm fitting structure to secure the cystocele. If, however, the uterus is small and atrophic, I believe the vaginal hysterectomy performed after the method devised by the Mayos in which the broad ligaments are brought together and interposed between the anterior vaginal wall and the bladder gives the most satisfactory results. An important feature of the Wertheim-Watkins operation is the fixation of the cervix high in the vaginal vault. In the event amputation of the cervix is necessary the stump should be treated in the same manner. It seems needless to say that a perineorrhaphy is always necessary. The degree of the perineorrhaphy would depend largely upon the age of the patient, marital state, and the degree of laceration.

In the Mayo type of operation it is some times necessary to insert a purse-string suture, incorporating the uterosacral ligament.

Many cases of prolapse have an ulceration of the cervix, but in our experience we have never seen a carcinoma of the cervix in a second or third degree prolapse. It does not necessarily follow, however, that this cannot happen, but this has been our observation.

When should one do a Mayo type of operation? If the uterus is small, as it often is in senile women; if it is a bleeding uterus of fibrosis uteri; if the uterus contains multiple fibroids of not too large a size, then a Mayo type should be performed. If the uterus is of sufficient size to be interposed, the Wertheim operation should be done. We have in several cases where fibroids were small performed a myomectomy and then interposed the remaining uterus. It is our opinion that in all Wertheim-Watkins operations the patient should be sterilized without exception.

We wish to report a series of 110 cases, ranging in age from twenty-seven to sixty-nine years. The majority were at or near the menopause, the average age being forty-nine years. We have been able to follow up either personally or by letter 100 cases, from which the following conclusions can be drawn.

Fifty-three per cent were known to have had instrumental deliveries. The number of labors varied from one to thirteen, the average being 4.8 labors. In our series of 110 cases we had one postoperative death—a patient fifty-two years of age, operated in 1921, developed a hyperthyroid crisis which was unrecognized at the time of operation. This patient died on the second day postoperatively. Two additional patients have died since operation, one from carcinoma of the stomach and in the other case the cause of death was undetermined. From information available it had no connection with the pelvic condition.

In this series of 100 cases with complete "follow-up" 70 were of the typical Wertheim-Watkins interposition operation, the remaining thirty having the Mayo type with vaginal hysterectomy. In those of the typical Wertheim-Watkins interposition type successful anatomical results were obtained in 69 of the 70 cases, one case being a failure on account of recurrence of prolapse of the fundus through the anterior wall of the vagina. Either the uterus was too small for an interposition type of opera-

TABLE I. SUMMARY

	WATKINS-WERTHEIM		MAYO		TOTAL	
		%		%		%
Number of cases	76		34		110	
Number of follow-up	70		30		100	
Successful anatomically	69	98.6	25	83.3	94	94
Failures anatomically	1	1.4	5	16.7	6	6
Successful symptomatically	66	94.3	26	86.6	92	92
Failures symptomatically	4	5.7	4	13.4	8	8

tion or the anchoring sutures gave away. This taught us that a close anchoring of the fundus of the uterus under the pubes by four absorbable sutures is very essential. The two medial sutures should be parallel to and quite close to the urethra.

Four of the 70 cases had symptomatic failures, complaining as follows:

One had some discomfort during menses.
One had urinary incontinence of a mild degree.
Two had frequency and occasional dysuria.

These are classified as symptomatically unsuccessful results because the patient was not fully satisfied. There is some doubt whether or not the complaint is a direct result of the operative procedure. All of these four cases, however, had very good anatomical results.

The Mayo type of vaginal hysterectomy with interposition of the broad ligaments was performed in 30 cases and the end-results show a successful

anatomical outcome in 25 cases. The anatomical failures in this type of operation, five in number, had prolapse of the vault of the vagina and varying degrees of discomfort.

CONCLUSIONS

From these observations we can draw the following conclusions:

The Wertheim-Watkins operation is the operation of choice where the size of the uterus permits its interposition.

The Mayo hysterectomy, interposition type, is indicated where the uterus is small and will not permit its interposition.

Failures in the Wertheim-Watkins operation are negligible, in our series, one in seventy.

Failures in the Mayo type of operation were 5 in the 30 cases operated. All 5 cases had a prolapse of the vault of the vagina. Failure may be prevented by better closure of the space between the broad ligaments and the uterosacral ligaments.

REFERENCES

(1) *Baer, J. L., and Reis, R. A.:* Am. J. Obst. & Gynec. **17**: 233, 1929. (2) *Bloom, O. H.:* N. Y. State Med. J. **30**: 19, 1930. (3) *Brady, Leo:* Surg. Gynec. Obst. **43**: 476, 1926. (4) *Bullard, E. A.:* Am. J. Obst. & Gynec. **11**: 623, 1926. (5) *Clark, J. G.:* Surg. Gynec. Obst. 1925. (6) *Counseller, V. S., and Stacy, Leda J.:* J. A. M. A. **95**: 983, 1930. (7) *Cron, R. S.:* Surg. Gynec. Obst. **43**: 698, 1926. (8) *Crowson, H. S.:* J. Missouri S. Med. Soc., February, 1931. (9) *Johnson, F. W.:* Surg. Gynec. Obst. **42**: 527, 1926. (10) *Masson, J. C.:* Minnesota Med. **12**: 67, 1929. (11) *Mayo, W. J.:* J. Obst. & Gyn. June, 1927. (12) *Meshburg, P.:* Am. J. Obst. & Gynec. **21**: 398, 1931. (13) *Phaneuf, L. E.:* New England J. Med. **201**: 875, 1929. (14) *Watkins, T. J.:* Trans. Am. Gyn. Soc. **34**: 123, 1909.

205 West Second Street.

ABSTRACT OF DISCUSSION

DR. H. W. KOSTMAYER, New Orleans, La.—We have a different criterion for determining whether we should do an interposition operation or a vaginal hysterectomy. We do not consider the size of a uterus so much as the degree of descent. To put it another way, if the outstanding pathologic change is that of relaxation of the anterior vaginal wall with a moderate degree of prolapse of the uterus, so-called second degree, we feel that if there is no contraindication such as disease of the uterus or fibroids, that the interposition operation is the method of choice. If there is complete descent of the uterus associated with cystocele or without it, the operation of choice is removal of the uterus. We base the assumption on the fact that after all when you are operating for prolapse of the uterus or for large cystocele you are operating because in the final analysis the broad ligaments have so elongated that they permit of descent of the uterus in the one instance, or in the case of a large cystocele you are depending on the broad ligaments ultimately to support the structure that has been damaged, that is the anterior vaginal wall. So we carry this a little further and determine the amount of broad ligament that should be removed. If we do the Mayo type of operation and there is moderate elongation of the broad ligaments, we take out as little as possible in removing the uterus. If there is an exaggerated type of prolapse we go well out on the broad ligament structure, even at times removing tubes and ovaries with it. And so we base our theory of this procedure on the fact that we are going to support the structure with the broad ligaments that have elongated so that they can no longer hold the structures within the pelvic cavity.

DR. L. A. CALKINS, KANSAS CITY, MO.—In selecting the type of operation for prolapsed uterus, I think we should perhaps pay a little more attention to etiology than has been brought out so far in this discussion. It is true that almost all cases of prolapse of the uterus do give a history of a prolonged, instrumental, or otherwise difficult labor. However, it is also true that the majority of cases of prolapse of the uterus occur in individuals who are asthenic. Ample proof of that is had from the cases of prolapsus in nulliparae. We recently had a case of prolapse in a newly born baby. Occult (or frank) spina bifida is known to be definitely associated with these cases and it is undoubtedly true that faulty nerve development is a great factor in the production of prolapse.

We therefore do not depend upon the relaxed broad ligaments in any case of definite prolapse. We do depend upon and routinely repair the pelvic floor to hold the cervix up behind, and perform a suspension operation to hold the uterus up in front. If the uterus be too small to be swung across the pelvis from anteriorly, at the symphysis, to the levator ani sling, posteriorly, we do an interposition operation because the uterus is still long enough to reach from the arcuate ligament to the strong part of the pelvic floor. We do not do a vaginal hysterectomy.

DR. F. H. FALLS, CHICAGO, ILL.—I would like to add two points to the discussion. First, as to the use of local anesthesia in these cases. A good many of these prolapses occur at a mature age and we have found that local anesthesia reinforced by morphine and scopolamine lends itself very well to the performance of this operation.

Another point is to cite a case in which a prolapse occurred in a rather elderly hard working woman. I did an interposition operation under local anesthesia followed by a perineorrhaphy. Because of her asthma and the increase of abdominal pressure, and also because of her occupation, the uterus was again completely prolapsed within a year after the interposition operation. I waited until June when her asthma was at its best and opened the anterior vaginal wall, freed, and pushed the uterus back into the abdomen. I then opened the abdomen and did a ventral fixation. Following this I overlapped the fascia of the anterior vaginal wall and did a perineorrhaphy. The woman had a rather stormy time for a few days but recovered and was able to do her hard work afterward and, in spite of asthmatic attacks, did not have a recurrence.

One other point which I think should be made is that in all of these cases of prolapse where a plastic operation is done we routinely do dilatation and curettage and also biopsy of the cervix to be sure that there is no beginning cancer before we do the plastic operation.

DR. COVENTRY (closing).—I think Dr. Kostmayer misunderstood me. We have never had a cystocele occur after these operations, but we have had a prolapse of the vault of the vagina, after a Mayo operation, which is a difficult thing to repair. If it is repaired, it means that the vagina has to be practically closed. It is this which we have tried to prevent by incorporating a stitch, which I think was described by Frank, so as to close off the vault of the vagina.

As far as the etiology is concerned, most of our cases were not of the asthenic type. There are cases of the congenital type, but we had only one in a virgin, and that was in an asthenic type of individual. In one case of prolapse operated by Wertheim method I used a linen suture to hold the fundus well up under the pubes. I afterward did this on other cases but in this locality the linen stitch is not absorbed, so we went back to the absorbable suture and placed it so as to hook the uterus more closely around the urethra. The lifting of the stump of the cervix, or the cervix itself, very high in the vaginal vault, which is the Manchester method used in the British Empire, is exceedingly important and is probably the keynote of the entire success of the Wertheim operation.

A REPORT OF THE END-RESULTS OF 554 CONSECUTIVE HYSTERECTOMIES*

LOUIS E. PHANEUF, M.D., F.A.C.S., AND MAURICE O. BELSON, M.D.,
BOSTON, MASS.

(From the Gynecological and Obstetrical Service of the Carney Hospital)

THE interest shown in the discussion of hysterectomy at the September, 1931 meeting of this Association, held at White Sulphur Springs, has led us to survey the operations performed on the Gynecological and Obstetrical Service of the Carney Hospital from January, 1915 to August, 1931, a period of fifteen years and seven months.

The points of interest in connection with hysterectomy are three in number, namely, (1) total versus subtotal hysterectomy; (2) the technic of operation; and (3) the end-results.

On the question of total versus subtotal hysterectomy the opinions are far from uniform. We have taken a middle ground. The age and the general condition of the patient are the factors on which the selection of the type of operation has been based. It is admitted that a badly lacerated and irritated cervix should not be left behind when hysterectomy is performed. With women at the age of the menopause we have preferred removing the entire uterus. When similar lesions are present in the younger women, we have felt that the cervix should be conserved to prevent the changes occurring in the vaginal vault following total removal. In order not to leave behind a lacerated or irritated cervix, we have treated it by trachelorrhaphy, by conical amputation (Sturmdorf), by total amputation, by cauterization, and of late, by conization with the high frequency current, using the Hyams technic and the electrode he has devised. In cases where the cervix is healthy and retained, we remove the cervical mucosa by coning it from above. By leaving a healthy cervix behind, we have overcome the chief objection to supravaginal amputation of the uterus. Given a woman in poor physical condition who needs a hysterectomy because of a benign lesion we prefer the subtotal procedure in the presence of a healthy cervix. If, on the other hand, the cervix needs attention, we do the operation in two stages, first the cervix and two weeks later the abdominal part of the operation. The technic of operation is well standardized and needs no detailed elaboration at this time. There are four distinct steps involved: (1) the removal of the uterus; (2) the tying of the vessels of each side; (3) the suspension of the cervical stump or the vaginal cuff as the case may be; and (4) the covering of all raw areas by peritoneum. Drainage is seldom necessary in the incom-

*Read at the Forty-Fifth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, French Lick Springs, Indiana, September 12, 13, and 14, 1932.

plete or subtotal operation. When it is, it can readily be accomplished by splitting the posterior lip of the cervix and introducing the drain in the vagina. Following the complete removal of the uterus, the vagina may be closed tightly as was done in many of our cases, or free vaginal drainage may be instituted. In many important European clinics they are leaving the vagina wide open and draining the parametria freely with gauze, preferably iodoform, claiming that the mortality and morbidity of the total hysterectomy is no greater than that of the subtotal when this procedure is employed. Interested by their results we are, at the present time, doing a series of cases with this method of drainage. We are favor-

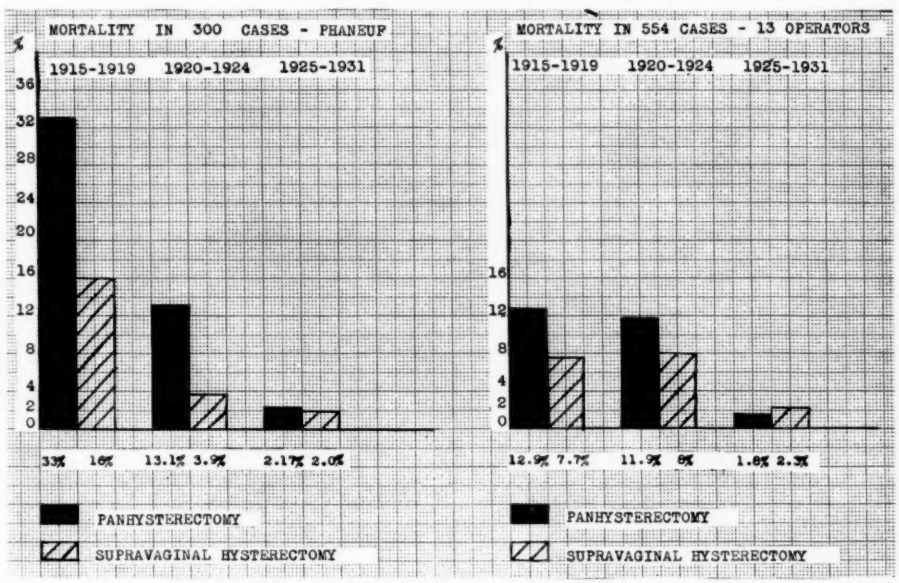

Fig. 1.—Shows the mortality of the three groups by operators. It is only fair to state that in the last two periods most of the bad risks were operated upon by one of us (Phaneuf). Taking the group of 300 cases by Phaneuf, in the panhysterectomies during the first five years, the mortality is given as 33 per cent. This group contained six cases with two deaths. One of the patients had a postoperative psychosis, jumped out of a window, and fractured her skull, whereas the other had acute cardiac failure after operation. The second five year group showed a gradual decrease in the mortality. In the last period of six years the mortality of panhysterectomy was 2.17 per cent. In the supravaginal hysterectomies the chart records a definite decrease in mortality, from 16 per cent in a small series making the first group, to 2.0 per cent in the last. Glancing at the total group by 13 operators including Phaneuf the mortality of the first two periods is but little changed, while it is markedly decreased in the last period. The chief factors in improving the mortality rate have rested in better preoperative preparation, improvements in anesthesia, shorter operating time, improved technic and better postoperative care.

ably impressed with our results although the number of patients is as yet too small to permit any conclusions.

We have analyzed the end-results of 554 consecutive hysterectomies of all types which are presented in tables and charts for the sake of convenience. Three hundred of these operations were performed by one of us (Phaneuf), and 254 by 12 other operators.

Table I shows that panhysterectomy was performed in 26 per cent of

TABLE I. DISTRIBUTION OF CASES AS REGARDS PARITY AND MENOPAUSE

	NULLIPARA	PRIMIPARA	MULTIPARA	MENOPAUSE
	Per cent	Per cent	Per cent	Per cent
Panhysterectomy	33	12	55	26
Supravaginal	43	14	43	9
Vaginal	3	11	86	54
Porro cesarean section	0	25	75	0
Hysterosalpingectomy	12.5	12.5	75	0
Wertheim	0	25	75	25

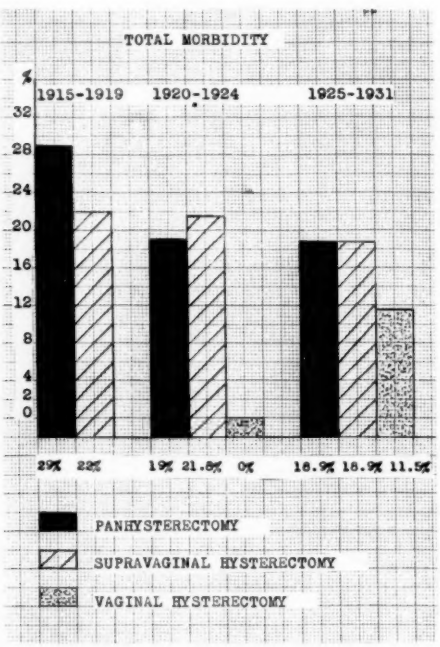

Fig. 2.—Graphically shows the morbidity in percentages. Our standard of morbidity for this purpose has been 101° F. (38.3° C.) for one day. In the first group the morbidity was greater by 7 per cent in panhysterectomy; in the second group supravaginal hysterectomy had a greater morbidity by 2.8 per cent, whereas in the last group the morbidity for both was exactly the same, 18.9 per cent. In general there is a slight decrease in morbidity. In the vaginal hysterectomies there was no morbidity in the second group. In the third group it was 11.5 per cent, which is 7.4 per cent less than it was in the abdominal hysterectomies of the same period.

the cases after the menopause as compared with 9 per cent of the supravaginal, showing that in the younger group of women an attempt was made to conserve the cervix. Hysterosalpingectomy (Beuttner operation) was performed for pelvic inflammation in young women, where the tubes showed such pathology that it was deemed unwise to conserve them, but the ovaries were healthy enough to be retained. The function of menstruation was therefore retained, although it was necessary to sacrifice the function of reproduction. It is interesting to note that 75 per cent of these patients had had more than one child, 12.5 per cent one child, and

12.5 per cent no children. The vaginal hysterectomies were performed on multiparous women in 86 per cent of the cases and 54 per cent of the patients so operated upon were beyond the menopause.

TABLE II. AGE TABLE

AGES	18-19		20-29		30-39		40-49		50-59		60-69		AVERAGE AGE
	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT	
Panhysterectomy			8	4.4	46	25.5	88	48.8	30	16.6	8	4.4	42.56
Supravaginal	5	1.6	50	16	124	40.1	108	35.5	20	6.4	2	0.6	37.77
Vaginal			1	2.8	3	8.5	11	31.4	6	17.1	14	40	51.65
Porro cesarean section					3	75	1	25					35.5
Hysterosalpingectomy			3	37.5	5	62.5							31.0
Wertheim					5	71.4	2	28.6					37.2

Table II shows that the average age of the women who had vaginal hysterectomies was 51.65 years, indicating that this method was largely used in older women. Those who had panhysterectomies had an average age of 42.56 years, while the average age of the patients who had supravaginal hysterectomies was 37.77 years, denoting an attempt at conservation of the cervix in the younger women. The hysterosalpingectomies (Beuttner) were performed on women whose average age was thirty-one years, because we felt it was important to conserve the function of menstruation.

We have grouped in Table III the five most common symptoms complained of. By pain we mean any lower abdominal pain or discomfort. Abnormal bleeding refers to menorrhagia or metrorrhagia or both. Abdominal tumor means that the patient complained of a mass in the abdo-

TABLE III. PERCENTAGE OF THE FIVE MOST COMMON SYMPTOMS

	PAIN	ABNORMAL BLEEDING	ABDOMINAL TUMOR	VAGINAL TUMOR	LEUCORRHEA	URINARY
Panhysterectomy	56	70	9	2	30	9
Supravaginal	76	52	11	5	30	13
Vaginal	20	54	0	54	20	17
Hysterosalpingectomy	100	25	0	12	75	0
Wertheim	28	56	0	0	71	0

TABLE IV. PREVIOUS LAPAROTOMY

	Per cent
Panhysterectomy	18
Supravaginal	30
Vaginal	17
Porro cesarean section	25
Hysterosalpingectomy	25
Wertheim	0

TABLE V. ASSOCIATION OF PERINEAL OPERATIONS WITH HYSTERECTOMY

	LAPAROTOMY				LAPAROTOMY AND PERINEAL			
	SIMPLE*		COMPLICATED		SIMPLE		COMPLICATED	
	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT
Panhysterectomy	100	56	50	28	17	9	13	7
Supravaginal	110	34	150	47	19	6	41	13
Porro cesarean section			4	100				
Hysterosalpingectomy	1	12	2	25			5	63
Wertheim			7	100				

*Simple = Single anatomical or pathologic defect.
Complicated = More than one.

TABLE VI. OPERATIVE COMPLICATIONS

	1915-1919		1920-1924			1925-1931		
	PAN.	SUPRA-VAGINAL	PAN.	SUPRA-VAGINAL	VAGI-NAL	PAN.	SUPRA-VAGINAL	VAGI-NAL
Bladder injured		1		1		1	1	
Bowel injured	2	1		1			1	
Uterus torn from cervix	1							
Heart	1							
Ureter constricted								1
	4 or 4.7%	2 or 1.9%	0	2 or 2.3%	0	1 or 1.8%	2 or 1.4%	1 or 3.8%

Total Years:

Panhysterectomy	5 or 2.7%
Supravaginal hysterectomy	6 or 1.8%
Vaginal hysterectomy	1 or 3.8%

men. Vaginal tumor denotes any prolapse or bulging at the vaginal introitus. Leucorrhea and urinary symptoms are self-explanatory. The percentage of bleeding was greatest in the panhysterectomies, being mentioned in 70 per cent as compared with 52 per cent in supravaginal and 54 per cent in vaginal hysterectomies. Pain was most common in the hysterosalpingectomy group, being present in 100 per cent of the cases. Vaginal tumor or bulging was found in 54 per cent of the vaginal procedures. Leucorrhea was the second symptom in prominence in the hysterosalpingectomies occurring in 75 per cent of them.

Previous laparotomies had been performed in 18 per cent of the panhysterectomies, 30 per cent of the supravaginal hysterectomies, and 25 per cent of the hysterosalpingectomies, showing that an attempt at conservation had been made without relieving the symptoms.

Table V presents the association of perineal operations with hysterectomy. Simple laparotomy refers to a single anatomical or pathologic defect, while a complicated laparotomy refers to more than one defect. In the panhysterectomies, 56 per cent were simple and 28 per

TABLE VII. POSTOPERATIVE COMPLICATIONS

	1915-1919		1920-1924			1925-1931		
	PAN.	SUPRA-VAGINAL	PAN.	SUPRA-VAGINAL	VAGI-NAL	PAN.	SUPRA-VAGINAL	VAGI-NAL
Ileus	1	2				1	1	
Peritonitis	1	1						
Pulmonary embolus		2						
Shock	4	1		2				
Incisional abscess	1							
Separation of incision				1			2	
Phlebitis	1			1			1	
Intestinal obstruction			1					
Myocarditis			2					
Pneumonia		2		1				
Incisional hernia	1							
Pelvic abscess	1							
Furunculosis	1							
Liver abscess	1							
Anuria								1
Fecal fistula							1	
Postoperative insanity		1						
	12 or 14%	9 or 8.6%	3 or 7.1%	5 or 5.7%	0	1 or 1.88%	5 or 3.9%	1 or 3.8%

Total Years:

Panhysterectomy	16 or 8.8%
Supravaginal hysterectomy	19 or 5.9%
Vaginal hysterectomy	1 or 3.8%

cent were complicated as compared with 34 per cent simple laparotomies and 47 per cent complicated in the supravaginal. It is evident from this that in the supravaginal group there were more complicated anatomical

TABLE VIII. OPERATIVE PROCEDURES

	PAN-HYSTER-ECTOMY	SUPRA-VAGI-NAL	VAGI-NAL	WER-THEIM	PORRO CESAREAN SECTION	HYSTERO-SALPIN-GECTOMY
Panhysterectomy	180					
Supravaginal hysterectomy		320				
Vaginal hysterectomy			35			
Wertheim radical hysterectomy				7		
Porro cesarean section					4	
Hysterosalpingectomy (Beuttner)						8
Salpingectomy, double	154	246	7		3	
Salpingectomy, single	10	36	2			
Oophorectomy, double	151	235	7		3	
Oophorectomy, single	15	49	2			1
Appendectomy	68	137			1	5
Cystectomy, parovarian		1				
Ovarian transplant	1	8				
Bowel repair	2	3				
Bladder repair	1	3				
Cholecystectomy		1				
Drainage of pelvic abscess	1					
Obliteration of culdesac of Douglas (Moschowitz)		3				
Herniorrhaphy, ventral		3				
Herniorrhaphy, umbilical	3	1				
Herniorrhaphy, inguinal	1	2				
Herniorrhaphy, femoral		1				
Citrate transfusion	11	9		1	1	
Intestinal resection and anastomosis		1				
Cecostomy	1	1				
Gastroenterostomy undone		1				
Curettage	24	34	1			3
Cauterization of cervix		9				1
Amputation of cervix		8				2
Trachelorrhaphy		12				
Anterior colporrhaphy	2	14	4			1
Perineorrhaphy	6	23	24			2
Third degree perineorrhaphy			1			
Vaginal myomectomy		1				
Interposition of broad ligaments			13			
Fixation of broad ligaments to vaginal cuff			1			

defects. The association of perineal operations with the laparotomy was almost equal in both groups of cases.

Dividing the cases in three periods, we find a decrease of complications in the last period. They were, as shown in Table VI, 1.8 per cent for the total hysterectomy and 1.4 per cent for the subtotal. The complications were essentially bladder and bowel injuries. In the vaginal hysterec-

tomies there were no operations in the first period, there were no complications in the second period, and one complication or 3.8 per cent in the third period, which was the constriction of an anomalous ureter.

Table VII shows that the postoperative complications in the panhysterectomies, which were greater than in the subtotal in the first two periods, became less than those of the supravaginal in the last period, the ratio being 1.88 per cent for the total against 3.9 per cent for the subtotal. In considering the whole group the vaginal hysterectomy has the least number of postoperative complications.

Table VIII shows that in 180 panhysterectomies 451 additional procedures were done. In 320 supravaginal hysterectomies 842 supplementary operations were recorded. In 35 vaginal hysterectomies we find 62 additional procedures. In 7 Wertheim radical dissections the only addition was a preoperative blood transfusion. In 4 Porro amputations there were 8 additional operations, while in 8 hysterosalpingectomies there were 15.

Table IX presents the chief operative diagnoses in the various groups and is self-explanatory. The 16 panhysterectomies for carcinoma of the cervix had had previous radium treatment.

Table X reports the additional operative diagnoses. These are apparent and need no comment.

TABLE IX. CHIEF OPERATIVE DIAGNOSES

	PAN-HYSTER-ECTOMY	SUPRA-VAGI-NAL	VAGI-NAL	WER-THEIM	PORRO CESAREAN	HYSTERO-SALPIN-GECTOMY
Chronic pelvic inflammation	18	120			1	4
Chronic salpingitis	2	3				4
Pelvic abscess		2				
Myomata uteri	87	158	2		1	
Fibrosis uteri	2	6	2			
Hypertrophic endometritis	6	2				
Hyperplastic uterus	6	7				
Essential menorrhagia and metrorrhagia	12	11	7			
Placenta accreta		1				
Inverted puerperal gangrenous uterus	1					
Infected pregnant uterus with cephalopelvic disproportion					3	
Ruptured ectopic pregnancy	2	5				
Ruptured uterus	1	2				
Endometriosis	1	7				
Carcinoma of ovary	1					
Ovarian cyst (dermoid)	2	1				
Ovarian cyst (benign)	21	51	1			
Parovarian cyst		1				
Carcinoma of fundus uteri	25					
Carcinoma of cervix uteri	16			7		
Cervical polyps	4		1			
Procidentia			26			

TABLE X. ADDITIONAL OPERATIVE DIAGNOSES

	PAN-HYSTER-ECTOMY	SUPRA-VAGI-NAL	VAGI-NAL	WER-THEIM	PORRO CESAREAN	HYSTERO-SALPIN-GECTOMY
Rectocele		21	8			
Relaxed perineum	6		1			1
Enterocele		3				
Cystocele	1	12	2			1
Lacerated cervix	19	17	8			3
Erosion of cervix	10	2	2			
Cystic glands of cervix	2					
Prolapse of uterus	2	12				
Retroversion of uterus	2	4				
Chronic appendicitis	13	28				
Cholelithiasis	5	7				
Diabetes	1	1	1			
Tabes dorsalis	1					
Ruptured corpus luteum with hemorrhage	1	2				
Hernia, ventral	1	3				
Hernia, umbilical	3	1				
Hernia, inguinal	1	2				
Hernia, femoral		1				
Uterus bicornis, bicollis		1				

SUMMARY

1. There are 554 hysterectomies of all types reported as follows: 180 panhysterectomies, 320 supravaginal, 35 vaginal, 7 Wertheim, 4 Porro and 8 hysterosalpingectomies (Beuttner). They are grouped in three periods.

2. In our last group of cases, covering the years 1925 to 1931, the mortality of panhysterectomy has been half a per cent lower than that of supravaginal.

3. In this same period of time the morbidity for the two methods has been exactly the same.

4. Vaginal hysterectomy is an ideal method in older women where sufficient relaxation of the vagina exists to give easy access to the pelvic organs.

5. The chief symptoms for which the operation was performed were pain, hemorrhage, and tumor.

6. The average age of the patients who had vaginal hysterectomies was 51.6 years, panhysterectomies 42.5 years, supravaginal hysterectomies 37.7 years, while the hysterosalpingectomies, (Beuttner) were performed on women whose average age was thirty-one years.

270 COMMONWEALTH AVENUE.

ABSTRACT OF DISCUSSION

DR. JAMES F. BALDWIN, COLUMBUS, OHIO.—My particular interest is to emphasize the importance, in practically all cases of hysterectomy, of removing the cervix. I know or more than forty cases in which, after supracervical amputation, cancer devel-

oped in the cervix. In all of these cases the disease appeared long after the original operation.

The unremoved cervix is liable, particularly in women who have borne children, to develop cancer, is frequently the source of an annoying leucorrhea, and sometimes of pronounced dyspareunia. In one of my cases the cervix, which had been left behind after a panhysterectomy by a Birmingham surgeon twenty-five years before, had become the starting point of a very ugly mass of fibroids, quite filling the pelvis and weighing more than four pounds. The cervix itself was scarcely larger than the last joint of the little finger, but these fibroids had sprung from the upper end.

That a nulliparous cervix is less liable to make trouble than a multiparous one, is admitted; but no remnant cervix is without ample possibilities of disease, is of no possible use, and its removal as a prophylactic measure is clearly indicated. I have been obliged in a number of instances to remove through the vagina the cervix that had thus been left; and such removal is infinitely more difficult, more time-consuming and vastly more dangerous than its removal at the original operation.

With the proper exposure of the pelvis by the Trendelenburg position, and care to see that the bladder has been previously emptied, it would seem to be practically impossible in any way to injure the bladder, ureter or bowel; and with peritonealization as advised, intestinal obstruction would apparently be entirely out of the picture. This statement is based on a personal experience of over 6000 hysterectomies. On a very few occasions it was found necessary to remove the lower end of a ureter involved in the cancerous growth, and to implant the proximal end in the bladder; these cases all did well. On one occasion the cancer had so involved the right ureter that its excision left the ureteral stump too short for implantation into the bladder. The ureter was therefore ligated tightly with silk and dropped. The patient made a fine operative recovery, but died of cancer a little more than a year later. Autopsy showed that death had occurred from metastasis to the retroperitoneal glands, but there was no involvement whatever of the pelvic tissues. The kidney, which had given no trouble whatever, was found somewhat contracted and with a slight dilatation of the ureter above the ligature.

In another case, of similar character, a large portion of the left ureter was exposed in removing the cancerous tissue. The uninjured ureter was carefully covered with peritoneum but there had been too great an interference with the blood supply and a few days later a ureterovaginal fistula developed, provision for which had been made by a little drainage wick. The patient made a good recovery, but in due time it seemed wise to remove the kidney; this was done without difficulty and with complete, though necessarily not lasting, convalescence.

A few suggestions as to technic may be in order. So far as I can learn few operators take pains, at least the pains that I always take, to sterilize the vagina before opening the abdomen. The danger of infection coming from the vagina is of such vital importance that I never trust the cleansing to an assistant. I wash out the vagina thoroughly personally with tincture of green soap and *hot* water, being careful to thoroughly reach every part. Then, lest infection might enter the vagina from the uterine cavity, I catch the anterior lip of the cervix with a volsellum and fill the uterine cavity with full strength tincture of iodine by means of a special pipette. Some of this iodine runs back into the vagina, but I at once flush the entire vagina with one-fourth strength tincture of iodine, so that I can look upon that entire area as well sterilized, and its sterility, I think, has been demonstrated by the fact that I have never had a peritonitis coming from that source.

Another very important feature of the operation, after attaching the ligaments to the vault of the vagina, is, as the author states, the peritonealization of all bare surfaces. This can usually be done by bringing over adjacent peritoneum, but in some cases can only be done by leaving the vagina open and passing into it the ends of three strips of iodoform gauze, each strip a yard long and 12 inches wide, with the raw edges turned in so as to avoid ravelings. The rest of the strips are then carefully placed so as

to fill the true pelvis, and over these the sigmoid is swung around and attached by a continuous suture to the brim of the pelvis. There is thus no raw surface left exposed. This gauze fluff is left undisturbed for one week, and then is easily withdrawn by catching the vaginal ends. The use of this gauze fluff obviates all fear of postoperative adhesions and postoperative ileus. (This method of utilizing the sigmoid was introduced by Dr. J. E. Summers, of Omaha, Neb., *Surgery, Gynecology and Obstetrics*, August, 1911.)

Generally only four ligatures are necessary, one on each uterine and one on each ovarian artery. Occasionally some branch will require a ligature; but, as I demonstrated by dissection a good many years ago, the round ligament arteries with the rarest possible exception never need ligation.

I see no reason for making a two-stage operation of a hysterectomy, removing the cervix at the first and a few weeks later subjecting the patient to a second operation for removal of the body of the uterus. The removal of the cervix by an experienced operator will require but an additional minute or two, and frequently will require less time than to properly implant the ligaments into the cervix and peritonealize the field of operation.

In all ordinary hysterectomies, the vault of the vagina should be closed by a purse-string or transverse continuous suture catching the submucous tissues, followed by a continuous suture bringing the peritoneum together. No provision for drainage is necessary. In women under forty it is usually desirable, if the organs are healthy, to leave the tubes and ovaries, or at least one ovary. Leaving the tubes saves a little time and gives a better blood supply to the ovaries. These appendages should be attached high up on each side of the pelvis, so as to avoid any possibility of dyspareunia which is so apt to occur if they are allowed to drop, as is so frequently the case, to the bottom of the pelvis.

The death rate in ordinary hysterectomy should not exceed 1.5 per cent, but in cases of malignancy or preexisting infection the death rate will necessarily be higher.

DR. P. B. BLAND, PHILADELPHIA, PA.—While there is still some controversy with regard to supravaginal versus complete hysterectomy, I personally perform the less formidable operation whenever possible, because the operation is infinitely easier to perform and the results both immediate and remote are far better than after the major operation.

My personal records of gynecologic operations show, in 1500 consecutive operations, 202 hysterectomies, an incidence of 1.3 per cent. These included 146 supravaginal operations, 26 complete operations and 30 vaginal operations. The age of the patients varied, the youngest being 25 and the oldest 71. The average ranged from 25 to 40. There were 8 deaths, a mortality of 3.9 per cent, divided as follows: After supravaginal operation 4; after complete hysterectomy, 3; after vaginal operation, 1, or 3.10 per cent.

In one hospital I covered the clinical records of 3103 gynecologic operations and found that 298 hysterectomies were performed, an incidence of something less than 1 per cent. These included 221 supravaginal, 52 complete, and 25 vaginal operations. The age of the youngest patient was eight and the oldest seventy-one. In the 298 hysterectomies performed there were 11 deaths, a mortality of 3.7 per cent, divided as follows: after supravaginal 3; after the complete operation, 3; after the vaginal procedure 5.

DR. JAMES E. KING, BUFFALO, N. Y.—The discussion has apparently focused upon the question of whether panhysterectomy or the supravaginal method is preferable. For me that has not, in recent years, been a problem because I believe that the diseased cervix, excluding carcinoma, of course, can be taken care of satisfactorily with the cautery.

My big problem has been with the patients who have not reached the menopause. In such cases it has been my practice in doing a supravaginal operation to leave the ovaries.

My experience with some of these patients has been unfortunate as they have returned to me with ovarian cysts or other ovarian conditions which have required operation. This occurred in spite of the fact that at the first operation the ovaries were apparently perfectly normal according to the operative report.

DR. GEORGE GELLHORN, ST. LOUIS, MO.—Dr. Phaneuf has shown convincingly that to him who takes the trouble of perfecting his technic, *total* abdominal hysterectomy is attended with no greater danger than the *supravaginal* operation, and I am in hearty accord with that idea. I was even more pleased with the emphasis laid upon vaginal hysterectomy. The value of vaginal hysterectomy cannot be overestimated; yet, this operation has not become popular among gynecologists. This is all the more surprising as major vaginal operations really originated in this country. Robert Battey of Rome, Georgia, in 1876, was the first to approach the genital organs through the vagina. His example was followed a decade or so later in Germany where the technic of vaginal operations was extended to a high degree of perfection. In America, however, these operations have fallen into disuse, and the present generation of young gynecologists grow up without receiving instruction in this particular field. This is rather deplorable because the advantages of vaginal over abdominal operations are indisputable in a large number of cases.

DR. JAMES W. KENNEDY, PHILADELPHIA, PA.—At present I remove the uterus by the vaginal route, clamp method, in about 95 per cent of the cases. At this moment I am willing to go on record by the prophecy that in the future there will be a greater number of vaginal hysterectomies performed. I have given up the ligature method of performing the vaginal hysterectomy and have adopted the clamps in the removal of the uterus. The clamp method will increase the percentage of operability to a marked extent.

It is very much more thorough from the standpoint of tissue removed than the ligature method and therefore we have adopted it in the malignant conditions of the uterus. The slough which follows the clamp method of vaginal hysterectomy occurring on about the twelfth postoperative day is, in our opinion, a very important and eventful influence in its splendid results in the surgical treatment of the malignant uterus.

The death rate of vaginal hysterectomy, clamp method, has been in our experience in the Joseph Price Hospital a fraction of one per cent.

DR. JAMES E. DAVIS, ANN ARBOR, MICHIGAN.—The controversial points involved in hysterectomy would be cleared if the selection of cases were the same by the different operators. In the group of cases studied by me a couple of years ago and reported before this Association a number of uteri were removed where there was no indication for the removal except a slight hypertrophy or metaplasia of the myometrium. A study of these cases in a large percentage of instances would have shown the pathology was in the ovary, or in the ovary and the pituitary. The endometrium is under the control of the ovary and possibly the pituitary. These uteri could be left alone and a number of deaths obviated, especially in the hands of the inexperienced operators.

Important points have already been made in regard to the indications for the removal of the cervix. It is worthwhile to emphasize the thought that if there is no infection, if the appearance indicates that the cervix is without pathology, then perhaps it could be safely left. If the cervix is lacerated, as is the case in the vast majority of instances, there will be found also erosion and infection, then removal or destruction of the endometrium should be accomplished. By so doing one adds a great measure of prevention against malignancy.

DR. F. S. WETHERELL, SYRACUSE, N. Y.—With the increased use of spinal anesthesia, a danger which is often lost sight of is that with a relaxed rectal sphincter and with the patient in the Trendelenburg position, some fecal material might be evacuated and travel into the vagina. When spinal anesthesia is used, the vagina should invariably be packed before the abdomen is opened.

PLACENTA ACCRETA*

Conservative Versus Radical Treatment, With a Report of Three Cases

E. Lee Dorsett, M.D., St. Louis, Mo.

PLACENTA accreta is a definite pathologic entity and should not be confused with retained placenta or adherent placenta. Polak states that in his experience it has occurred once in 6000 cases, while Foster of the Montreal Maternity reports it occurring once in 8000 cases. It is not the rarity of this condition that has prompted the report of these cases, but to bring out the fact that delay in diagnosis and treatment leads to disastrous results. The three cases here presented illustrate the condition from three different angles; the too conservative treatment; the conservative treatment at first, followed by radical treatment; and lastly, the immediate radical treatment.

The anatomic histologic picture of placenta accreta shows a more or less absence of the spongy layer of the decidua basalis. The villi penetrate the uterine muscle and in some areas become a part of the musculature; a number of cases have been reported in which the penetration has been down to the peritoneal covering of the uterus.

J. N. Nathanson is of the opinion that atrophy of the endometrium is a predisposing cause and also that the improper development of the corpus luteum causes a limited development of the decidua. It seems to be the consensus of opinion among the writers that a previous curettement is a cause of this condition and this point is brought out in the history of two of the cases herein reported. Previous pregnancies and manual removal of the placenta in other pregnancies have a bearing in causing this condition. All three of these cases were multiparous women, but none gave history of adherent placenta.

Experience shows how futile it is to try to remove the placenta or a greater part of it, from its implantation on and in the uterine wall, without a most severe hemorrhage or if the tissue is not all removed, an infection follows in an already exsanguinated patient. Where we are dealing with an adherent placenta, there is a definite decidua basalis present, and the placenta has not become more or less a part of the uterine muscle, so that when the hand explores the uterine cavity in an attempt to remove the placenta a definite line of cleavage is found, and it can readily be stripped from its attachment.

A great many of us are to be critized as to the management of the third stage of labor. We are anxious to finish our case, and by too violent mas-

*Read at the Forty-Fifth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, French Lick Springs, Ind., September 12, 13, and 14, 1932.

sage on the fundus, or retraction on the cord, or both, we hasten the third stage of labor. Just how long to wait before the placenta is expelled is a matter of personal opinion, but it seems to be an unwritten law that the placenta should be expressed at the end of twenty minutes. There should be no difficulty in recognizing a retained placenta but an adherent placenta and placenta accreta can only be diagnosed when the hand is introduced into the uterine cavity. A disturbance in mechanism is the underlying factor in the delay in the separation of an adherent placenta, but, as before stated, placenta accreta is entirely pathologic.

When it has been decided that a manual removal of the placenta is indicated, it should be done with the utmost care and having in mind the fact that if a definite line of cleavage cannot be determined, there is a placenta accreta present that cannot be removed. Furthermore if an attempt is made to remove it the patient will suffer from shock and hemorrhage, or the uterus may be perforated. In all of the cases reported here, an attempt was made to remove the placenta. Large pieces were removed, and in all cases this maneuver was followed by terrific hemorrhage. In the first case four attempts were made to remove the placental tissue without satisfactory results. Each time the patient had a hemorrhage, was packed, and required blood transfusion. A dull curette was used but very unsuccessfully because of the fear of perforating the uterus. This case developed sepsis and a pelvic abscess. The abscess was drained and after seven weeks the patient made a good recovery.

The second case had two attempts at removal of the placental tissue, was packed, had blood transfusions, and an unsuccessful attempt was made to ligate the uterine arteries from below. On the fourth postpartum day a total hysterectomy was performed, but the patient died of general peritonitis.

The third case was a patient thirty-six years old who had borne four children, had six abortions, four of the abortions requiring a curettement. In her last pregnancy she complained of constant uterine pain and on numerous occasions had severe uterine contractions. Her labor was precipitate at full term, a breech presentation with a prolapsed cord. A living baby was delivered, but after waiting forty-five minutes, an attempt was made to expel the placenta by the usual methods. This was unsuccessful, so a manual removal was decided upon. When the hand was introduced into the uterus the placenta was found to be firmly adherent with no line of cleavage present. Several large pieces were torn loose from the uterine wall followed by a copious hemorrhage. The uterine cavity was packed and the patient returned to bed and transfused. The patient was allowed to rest several hours and then was removed to the operating room and a supracervical hysterectomy was performed and the patient again transfused. This patient made a most remarkable recovery and left the hospital on the twelfth postoperative day.

The one successful case herein cited cannot be held up as being the cor-

rect method by which to treat this condition. The cases are so few and far between that even with all the cases collected and reported, we could not then pass judgment. From the meager reports so far found in the literature, there seems to be no doubt in the opinion of the writer that an immediate hysterectomy is indicated.

Klopten reports 46 cases with a mortality of 87.5 per cent when they were conservatively treated, as compared to 14.3 per cent when treated radically (by hysterectomy).

CONCLUSIONS

1. The three cases here presented are examples of conservative, and delayed radical treatment and immediate radical treatment.
2. Where no line of cleavage is present, and it is impossible to remove the placenta, hysterectomy should be performed as soon as possible.
3. Blood transfusion where there is severe hemorrhage is of the utmost importance.

CASE HISTORIES

CASE 1.—A woman, twenty-two years old, had one child two years previous to this pregnancy. At this time she had eclampsia. Entered hospital with history of one convulsion and only had one more after the intravascular injection of magnesium sulphate. At the time of her first delivery she had a third degree laceration of the perineum. It failed to heal and was subsequently repaired. August 6, 1924, she again entered the hospital in labor but two months premature. She delivered spontaneously of a 1820 gm. baby (died on the eleventh postpartum day). An attempt was made to express the placenta, but the usual method failed so a manual removal was attempted. No line of cleavage was found, and wrongly an attempt was made to remove the placenta piecemeal, with the result that the patient very nearly bled to death on the delivery table. The uterine cavity was packed, the patient returned to bed, 750 c.c. of citrated blood given intravenously. On the following day another attempt was made to remove the remaining pieces of placenta with a curette, but this was not very successful, and the patient again bled very profusely, was packed, and transfused. The packing was removed in twenty-four hours, and hemorrhage followed. She was again repacked and transfused. This procedure was again attempted on the following day with the same results and treatment. The fifth day very little hemorrhage followed the removal of the packing, but the patient began showing signs of sepsis and developed a pelvic cellulitis. A pelvic abscess developed, followed by operation four weeks after delivery. After a very stormy convalescence the patient recovered and left the hospital seven weeks after labor.

CASE 2.—Patient, aged thirty-five, gravida 4. Entered hospital in labor at full term. Had one abortion previous to this pregnancy and was curetted. In labor thirteen hours and delivered spontaneously of a living child. The placenta did not separate and an attempt was made to remove it manually. About half of the placenta was removed, but further attempt was impossible due to severe bleeding. The uterus was packed and the patient transfused. The following day an attempt was made to remove the remaining remnants of placental tissue with a dull curette, but this was not successful due to hemorrhage. The uterus was again packed and patient again transfused. Later in the day an attempt was made to ligate the uterine arteries per vaginum, but when the uterine packing was removed the bleeding was so profuse that the uterus was repacked and the patient prepared for a laparotomy. Operation: hysterectomy. The patient was transfused before and after the operation, but developed peritonitis and died on the eighth

postpartum day. (I am indebted to Dr. Sam Abrams of St. Louis for allowing me to report this case.)

CASE 3.—Patient, aged thirty-six, gravida 12. Had four living children, two premature labors at six months, and seven abortions (none induced). Patient and husband both had negative Wassermanns. During the last three months of her pregnancy the patient had almost constant uterine pain and irregular uterine contractions, and on two occasions went to the hospital thinking she was in active labor. On April 25, 1932, she reentered the hospital with a history of having had irregular contractions all night. Upon examination it was found that it was a breech presentation and vaginal examination revealed two finger dilatation. At 9:15 A.M. a hypodermic of 2 mm. of infundin was given. This increased the contractions, for a short time and the dose was repeated in one hour. This last injection was followed by very active contractions and in twenty minutes the membranes ruptured. When the patient arrived in the delivery room one foot and the cord had prolapsed. Under ether a living child was delivered easily. Repeated efforts with Credé's method failed. A manual removal was then decided upon, but when an attempt was made to remove the placenta, no definite line of cleavage was found, and wrongly an attempt was made to remove the placenta piecemeal. Immediately very copious hemorrhage resulted, and the uterus was packed, the patient given 750 c.c. of citrated blood and returned to bed. For several hours the patient showed evidence of shock but when these symptoms subsided she was taken to the operating room and a supravaginal hysterectomy was performed (both tubes and a cystic right ovary were removed at this time); 750 c.c. of blood was again given following the operation, and the patient showed no shock after returning from the operating room. She made an uneventful recovery and left the hospital on the twelfth day.

Examination of the uterus showed the endometrial surface was ragged and irregular, and in one portion was attached a large shaggy mass of placental tissue which represented the remains of the placenta accreta.

Histologic examination showed at the junction of the villi and the uterine muscle, only a small amount of decidual tissue and no spongy decidua anywhere. In many areas, only a thick layer of fibrin was interposed between the villi and muscle. The uterus away from the placental site showed a few decidual cells and underlying them considerable blood. With O. V. stain, the intima of the vessels was seen to show early edematous changes.

REFERENCES

(1) *Polak, J. C., and Phelan, G. W.:* Surg. Gynec. Obst. **38**: 181, 1924. (2) *Foster, D. S.:* J. Canadian M. A. (3) *Nathanson, J. N.:* AM. J. OBST. & GYNEC. **16**: 44, 1928. (4) *Williams:* Obstetrics, ed. 6, 1930, D. Appleton and Company. (5) Queen Charlotte's (Hospital) Practice of Obst. (6) *Lehmann, E.:* Monatschr. f. Geburtsh u. Gynäk. **68**: 201, 1925. (7) *Dietrich, H. A.:* Ztschr. f. Geburtsh u. Gynäk. **84**: 579, 1922. (8) *Tiemeyer, A. C.:* AM. J. OBST. & GYNEC. **22**: 106, 1931. (9) *Aschermann, G.:* Monatschr. f. Geburtsh. u. Gynäk. **78**: 75, 1928. (10) *Frank, R. T.:* AM. J. OBST. & GYNEC. **12**: 585, 1926. (11) *De Lee, Jos.:* Practice of Obstetrics. (12) *Eden and Holland:* Textbook of Obstetrics, New York, 1925, The Macmillan Company.

634 NORTH GRAND BOULEVARD.

ABSTRACT OF DISCUSSION

DR. FREDERICK H. FALLS, CHICAGO, ILL.—I have seen three of these cases. The first one was in consultation on about the eighth day of the puerperium with the patient almost exsanguinated from a continuous dribbling of blood. Attempts had been made after delivery to remove the placenta but they were only partially successful. Because of the anemia of the patient and some fever, I rather hesitated to open the abdomen. I transfused her and then removed about one-third of the placenta vaginally with an ovum forceps and the hand. The patient recovered.

Practically an identical case occurred in our clinic at the Research Hospital. The placenta was removed successfully with the hand several hours after delivery. The uterus was packed and the patient recovered.

In spite of the fortunate outcome in those cases, I feel, with Dr. Dorsett, that the radical treatment is the one of choice if after an attempt at removal it is felt that the placenta is too adherent or that it has not been completely removed, or if the patient bleeds following the packing of the uterus after it is thought that all of the placental tissue is removed. I think we are inclined to be too conservative about removing the uterus under these conditions. We are inclined to wait too long and let the patient bleed, become anemic and possibly develop a sepsis. Then when we decide that the uterus should be removed, conditions have developed which make hysterectomy extremely dangerous.

It is not always easy to differentiate between different degrees of adherence of placenta accreta. At the Chicago Lying-In Hospital, a resident found that the patient had a very adherent placenta, which he could not deliver by the usual methods. He inserted his hand into the uterus and found a very adherent mass. Finally he loosened it and on withdrawing his hand he found to his surprise that he had done a submucous myomectomy.

When placenta accreta is diagnosed or suspected an immediate determination by intrauterine manual exploration is indicated, followed by hysterectomy in all cases where insuperable difficulty is encountered in the removal of the placenta and this before severe postpartum hemorrhage or sepsis has increased the risk to the patient.

DR. FOSTER S. KELLOGG, Boston, Mass.—I have happened to be associated in one way or another with perhaps twelve or thirteen cases that have been diagnosed as adherent placenta. In my experience, the pathologists' reports have not been definite nor so satisfactory and I would like to raise this question in connection with the subject: Speaking broadly, there are clinically two distinct types of placenta accreta, one in which the placenta may be largely clawed off, and with or without packing the patient survives. The remaining pieces slough off, provided curettage is not resorted to, in about twenty-one days, or they come away in a puslike lochia and are never recognized. In the other type the patient may be saved only by hysterectomy. Dr. Mallory studying both of these varieties in the pathologic laboratory invariably sends back the same report on the one or the other specimen. In other words, translating his pathology into our clinical observation, it is purely a qualitative matter. I hope further pathologic study will reveal some quantitative rather than qualitative differences.

DR. BETHEL SOLOMONS, Dublin, Ireland.—I feel that obstetricians who have a large experience make very clear the fact that placenta accreta is an extraordinarily rare condition because I find that junior obstetricians seem to think that it is a very common thing from reading a few cases reported.

One point that has been made clear is the differentiation between placenta accreta and adherent placenta. If a junior tells me that he has an adherent placenta in a primipara, I do not believe it. I have never seen such a thing. I have seen placentas that have been called adherent and I always find them to be simply retained placentas. In the last 50,000 labors at the Rotunda Hospital there has been no case of placenta accreta, so I think it may be taken as a very rare condition, in Ireland at any rate. However, I had a patient during the last two months upon whom I operated. It was that of a woman doctor who was having an operation outside the hospital. She was one of those patients who, in the absence of anything pathologic had had a dead baby in her first confinement. A complete routine examination was made of both the patient and the fetus in an effort to find out why the baby had died. She was a woman of forty-two and after consultation it was decided to do a cesarean section when she came to term. On attempting to remove the placenta it was found that it could not be budged. It was welded to the uterine wall and the attempt was given up because obviously it

would have been necessary to tear large pieces out of the uterine wall. A hysterectomy was performed. It was a true placenta accreta.

DR. ALBERT MATHIEU, PORTLAND, OREGON.—I have among my case reports one of a placenta accreta found at cesarean section and complicated by a breech presentation, a large cyst of the cervix and a cervical stenosis. Because of a breech presentation in a forty-three-year-old primipara with an undemonstrable external cervical os and a large cervical cyst, I started a classical cesarean section. A baby weighing 4285 gm. was extracted. Upon attempting to remove the placenta it was found to be growing into the myometrium and attempts to wipe it loose with a towel were of no avail. At each effort masses of placental tissue were left attached to the uterus. As considerable blood was being lost during the procedure, a rapid supravaginal hysterectomy was performed. The pathologic examination showed that the placental substance had apparently grown directly into the uterine tissue. A number of fibrous infarcts were present about the borders of the placental substance, and they also had a very close contact with the uterine wall. Cut sections through the placental substances showed it to be apparently normal.

Section through the placenta and uterine wall showed no distinct line of separation. The covering of the placental villi was continuous with the connective tissue stroma of the uterine musculature. Some of the decidual cells were in the formation of islands which were entirely surrounded by uterine muscle.

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—The pathology of this condition undoubtedly involves changes in blood vessels and blood spaces. The myometrium fails to normally limit the advance of the chorionic villi, and there follows a narrowing or thinning of the myometrial wall. Two grades of attachment of the placenta and myometrium can be described. Grade one can be considered somewhat akin to a diphtheritic type of infection. This type of infection would glue the placenta to the uterine wall but it would be possible to peel off the placental tissue, leaving a bleeding surface. In the second grade, because the blood supply has been destroyed and because the chorionic villi have advanced far into the myometrium, there is no possibility of separating the placenta from the myometrium. Here is the genuine type of inseparable placenta accreta.

In the first grade of attachment low grade infection may play a part in the adhesive process.

DR. RAYMOND A. D. GILLIS, PITTSBURGH, PA.—I should like to report my experience with one case. The patient came to the Mercy Hospital in Pittsburgh with a history of having been treated by a large dose of radium five years previously at the same institution. After the radium treatment she had not menstruated, so far as the history was obtainable. She was admitted to the hospital suffering from considerable abdominal pain and uterine discharge for weeks. She presented a mass in the abdomen about the size of a four or five months' pregnancy. There was some fever, the mass was tender and there was a foul discharge from the vagina. A diagnosis of pregnancy could not be made either by bimanual or abdominal examination and only with x-rays could the fetus be shown and its position determined. She had been in labor and having ineffectual contractions for a period of a week. By this time the uterus was infected and the membranes ruptured. It was possible to move the fetus around so that a foot could be brought through the cervix and finally a macerated fetus was delivered. Following this the placenta showed no sign of separation from the uterine wall, and it was concluded, on account of the previous radium treatments, that she probably had considerable atrophy, if not entire absence, of the decidua and possibly had a placenta accreta. No attempt was made on this account to remove the placenta from below and an immediate hysterectomy was recommended. The patient declined this operation and was sent back to the ward. Some days later the placenta was found to

be intact and, apart from developing a certain amount of cellulitis, the condition cleared up in a few weeks without any ill effects.

DR. ARTHUR J. SKEEL, CLEVELAND, OHIO.—For the last five years it has been our custom not to invade the uterus for a retained placenta. If the placenta is not expressed in a couple of hours the patient is put back to bed and not disturbed for eighteen to twenty-four hours, and in that time we have never failed to express the placenta readily without invading the vagina. I take it from the pathology of the placenta accreta that there should be no immediate hemorrhage. I am wondering what the indication was for removing the placenta manually and whether in the process of our usual procedure of letting the patient go back to bed for twenty-four hours if she had a true placenta accreta, would there be risk of hemorrhage?

DR. DORSETT (closing).—I feel that one of the etiologic factors in placenta accreta is the fact that a previous dilatation and curettage has been done. I am sure we all have reports returned from the laboratory that the tissue contained decidua plus uterine muscles; which proves that we have been a little too energetic in our cur curettements either for retained placental tissue or for diagnostic curettage.

Dr. Kellogg has brought out an interesting point in regard to the two types of placenta accreta and I feel that there is a difference of degree in the penetration of the villi. In some cases they may only penetrate a very short distance, and in other cases which have been reported, the pathologic specimens have shown where they have penetrated entirely through the muscularis of the uterus and down to the peritoneal coat.

ENDOMETRITIS AND PHYSOMETRA DUE TO WELCH BACILLUS*

FREDERICK H. FALLS, M.D., CHICAGO, ILL.

(From the Department of Obstetrics and Gynecology, University of Illinois College of Medicine, and Cook County Hospital)

PUERPERAL sepsis due to or associated with the Welch bacillus is relatively uncommon even in the practice of obstetricians of wide experience, and on active obstetric services. For this reason the nature of the infection, its pathogenesis, methods of diagnosis and management are often not thoroughly understood by the medical attendant, and the dangers and responsibilities attending such a case may be overlooked. In order for these factors to be fully appreciated, it becomes necessary to establish in the minds of the clinicians certain fundamental facts that have to do with the bacteriology and pathology of this disease so that intelligent management of a given case may be assured, even though the experience of the medical attendant may be limited in the care of this disease.

Most of the reports in the literature have to deal with individual case reports or small series of fatal cases. Reports from the surgical field also show a high mortality in this type of infection. The sinister reputation thus acquired has so stamped this disease that the clinician on realizing the presence of a gas bacillus puerperal sepsis is prone to give a very

*Read at a meeting of the Chicago Gynecological Society, April 15, 1932.

poor prognosis without attempting to base the same on a careful interpretation of the bacteriologic, pathologic, and clinical facts.

Because my experience with this disease has been rather unusual in that none of the cases have proved fatal it occurred to me that a presentation of this phase of the subject might be of service in rounding out the picture of gas bacillus infection in your minds. Moreover, I wish to point out that often the gas bacillus infection is present in certain puerperal cases and totally unsuspected.

Also, I wish to show that certain clinical phenomena when present should lead to a bacteriologic examination of the vaginal tract, the technic of which is very simple. Finally to emphasize the importance of meticulous care in the handling of these cases to avoid injury to the soft parts that might serve as a portal of entry for the infection into the blood stream or lymphatics.

There was considerable confusion in the minds of the earlier workers in this field due to the fact that a number of different names were applied to the same organism, and also, that the gas bacillus was not obtained from wounds in pure culture which led to confusion regarding its cultural characteristics. It is now recognized that the Vibrion septique of Pasteur, Bacillus Perfringens of the French, Fraenkels, Bacillus phlegmones Emphysematosae, Bacillus emphysematis vaginae, Lindenthal, Granulobacillus saccharobutyricous imobilis liquifaciens of Schattenfroh and Grassberger, Bacillus aerogenes aerophilis agilis, Uffenheimer, and Bacillus septique aerofie of Legres and Lecene are all the same organism as that described by Welch and Nuttall in 1892.

The first fact that strikes one on investigating the cause of this infection is that the human intestine and that of all of the domestic animals and rodents contain the organism. Immediately one remembers that most deliveries are attended by the extrusion of fecal material from the rectum late in the second stage of labor.

Even though the small particles of fecal matter are carefully removed as soon as they appear at the anus, bacteriologic contamination of the perineum and vagina is easily conceivable. The gas bacillus is probably a normal inhabitant of the vagina of women who have had a third degree tear or who have rectovaginal fistulae. When one remembers the contamination of the vaginal tract which probably frequently occurs in the most expert hands during a difficult forceps delivery or breech extraction, and which must occur almost invariably in the hands of inexperienced obstetricians during these operations, it is difficult to see why a large percentage of these cases are not exposed at least to the infection. It must follow therefore that only under exceptional circumstances does the gas bacillus produce infection and acquire the invasive power of a true pathogenic organism.

If this were not true there should occur epidemics of this type of infection. Furthermore the severe fulminating types of infection as in

the cases recently described by Toombs should be much more common than they are found to be among puerperal sepsis cases at this time. There is relatively little mention in the literature of the nonfatal types of gas bacillus infection.

The reason for this seems to be that the clinicians either do not appreciate the significance of the presence of gas in the generative track or they do not appreciate how relatively simple the bacteriologic technic is for the isolation of these bacteria in a given case.

PATHOLOGY

According to Welch there are five groups or types of cases.

Group I.—In which the fetus or product of conception shows emphysematous infiltration. These cases may show little or no general reaction.

Group II.—Puerperal endometritis in which the gas bacillus does not penetrate the uterine wall and the inflammatory reaction is limited to the endometrium. There usually is some general reaction which subsides in a few days and the patient goes on to recovery.

Group III.—Physometra or Tympania uteri in which the uterine cavity is distended with gas produced by the Welch bacillus. It has been shown that the colon bacillus and other gas producers never form large amounts of gas in the tissues of any but diabetic patients.

Group IV.—Emphysema of the uterine wall is usually associated with tympania uteri and is due to invasion of the wall by the gas bacillus via the lymphatics, K. Bingold. These cases are usually fatal.

Group V.—Gas sepsis in which the bacillus invades the blood stream through the blood vessels of lymphatics produce hemaglobinemia, jaundice, bronzing of the skin and later anemia. Nearly all of these cases are fatal.

The detection of a gas bacillus infection is as a rule not difficult if one is alert for the clinical manifestations of the disease and prepared to confirm clinical impression by bacteriologic investigation. The clinical picture varies from no general symptoms at all on the one hand to severe manifestations of a fulminating fatal puerperal sepsis on the other.

Since we are concerned with the milder nonfatal type of infection in this paper, we will confine ourselves to the symptoms seen in these cases.

The first thing that may arouse suspicion in the mind of the attendant regarding the possibility of a gas bacillus infection is the presence of gas bubbles in the vaginal secretions of women aborting or in active labor. This may be the only symptom or sign until the product of conception is passed at which time it will be seen to have gas bubbles on its surface, and in the case of well advanced fetuses there may be marked emphysematous infiltration of the subcutaneous tissues, and especially the "foamy liver." When the condition is more advanced to the stage of puerperal endometritis, there are frequently seen septic

phenomena such as fever, rapid pulse, leucocytosis, chills and nausea and vomiting. The uterus may be noted to be higher than usual, and tympanitic to percussion. The fetal outline will be masked and the uterus may be in tetanic contraction. The whole picture may simulate somewhat that seen in premature separation of the placenta except for the absence of signs of hemorrhage. Gas may be heard or seen escaping from the vagina with a crackling sound and the odor is a peculiar sweetish foul odor which is characteristic and once observed will almost suffice to establish a diagnosis without further investigation. The amount and tension of the gas in the uterus is almost unbelievable in some of these cases. This condition is only seen in women with well advanced pregnancy where the presenting part effectively blocks the lower uterine segment and cervix. In two of our cases on pushing up on the fetus a rush of gas was heard whistling out of the uterus as if a knife had been plunged into a tightly inflated football.

Following delivery in these cases there is usually a febrile reaction for a few days and then an uneventful convalescence. On the other hand the infection may go on to emphysema of the uterine wall, thrombophlebitis, lymphangitis, and fatal septicemia. Not all cases in which the organism has been cultivated from the blood show serious symptoms. According to Bingold one-third of all cases yielding positive blood cultures run an afebrile clinical course. We must explain this on the assumption that these organisms are relatively avirulent and were forced into the blood stream rather than that they gained entrance by their virulent penetrating power; and further that they yielded to the bactericidal power of the blood or the organs to which they are carried. It is probable that in most cases they cannot multiply in the blood stream because of its oxygen content until just before or just after death.

The bacteriologic diagnosis in a case suspected of harboring the gas bacillus is readily and simply made. Two ordinary tubes of litmus milk are poured together so that the resultant tube will be about half full of milk. This is then placed in boiling water for a few minutes to drive off the oxygen. On cooling a cream ring layer of fat will be noticed on top of the milk. This milk is then inoculated by means of a sterile swab or platinum loop dipped in the vaginal secretions; and incubated at 37½° over night. The next morning the so-called stormy fermentation will have occurred if the gas bacillus is present. This consists of the formation of a large amount of gas in the coagulum of the milk which has turned acid in reaction. In some cases the stoppers are blown out of the tubes. Liquefaction of the coagulum also takes place. Gas bubbles will be seen rising from the bottom of the tube and collected on the surface of the media. From the milk, smears are made and rather heavy gram-positive rods can be seen. Capsules can be demonstrated by special stains. A few cubic centimeters of the culture injected into the ear vein

of a rabbit are allowed to circulate for a few minutes and then the rabbit is killed and placed in the incubator for twenty-four hours. Autopsy shows the rabbit enormously distended with gas and what is most characteristic the so-called "foamy liver." This appearance is due to numerous gas bubbles that arise from the fermentation of the glycogen in the liver cells. Smears from the rabbit's tissues reveal the capsulated organism.

The clinical material upon which these observations were based was studied at the Cook County Hospital, University of Iowa, and at the University of Illinois Research Hospital. The patients were all charity patients and all were white women. Two of the series were at or near full term and had had labor pains for several hours with ruptured membranes and prolapsed cord. The other four were abortions in the early months. The details of the case histories are of interest and of some importance because of their bearing on the clinical management.

CASE 1.—Primipara twenty-two years old, Polish, had been in labor about fourteen hours when admitted to the Cook County Hospital about 6 A.M. one morning. She had been attended at her home by a midwife who made repeated vaginal examinations and who, when the membranes ruptured and the cord prolapsed, called in two doctors. They in turn tried to replace the cord and deliver the woman by version without success. The patient was then told that she would have to go to the County Hospital for delivery. She got up and dressed, and with the cord hanging down to her knees, boarded a street car and came about eight miles across town to the hospital. On admission the patient was prepared obstetrically. The pulseless discolored cord was disinfected as carefully as possible and cut off at the vulva. On vaginal examination the cervix was found to be about four centimeters dilated, pains rather weak and coming about every five minutes. A Voorhees number five bag was inserted and weight attached. This started good pains and the bag was expelled about 5 P.M. at which time nearly complete dilatation was present. On examination a hand and arm were found prolapsed in the vagina.

A sweetish foul odor was noticed but not correctly interpreted. Gas bubbles were noted in the vagina but still the diagnosis was unsuspected. It was decided to try carefully a podalic version to determine how tightly the uterus was clamped down on the child. On pushing up on the shoulder a large quantity of gas escaped with a whistling sound audible all over the room and filling the latter with the characteristic sweetish foul odor. I then made a tentative diagnosis of Welch bacillus infection and at the same time decided that version was too dangerous to attempt. The only alternative was decapitation, the prospect of which was anything but inviting because I realized fully the consequences of injury to the maternal soft parts, and implantation of gas bacilli into wounded smooth muscle. However, by careful manipulation of the Braun blunt hook over the neck and using a heavy blunt cleidotomy scissors to cut through the soft parts, I was able to decapitate and remove the fetus which was emphysematous throughout and from whose tissues the Welch bacillus was recovered in smear and culture. The next morning her temperature was 105.4° and she was tender over the lower abdomen and showed all the signs of a severe puerperal sepsis. My prognosis in the light of what I had read regarding gas bacillus infection was absolutely bad. I was greatly surprised to find her slightly improved the next day and temperature free on the sixth day. She left the hospital on the fourteenth day with no sign of residual pathology.

CASE 2.—Para iii, who, when first seen by me, was completing a three months' abortion. She was on the delivery bed at the Cook County Hospital, and there was no thought of infection in connection with the case in the minds of the attendants.

The history revealed that the abortion had been self induced by inserting into the cervix a piece of slippery elm which the patient had carried around in her pocketbook for two years. This had been done about twenty-four hours before and had resulted in some hemorrhage and the onset of uterine cramps. The patient had no fever and no evidence of septic reaction. On making suprapubic pressure to see whether the product of conception could be expressed, gas bubbles were noted coming from the vagina along with a small amount of bloody secretion. Culture taken in litmus milk showed stormy fermentation and gave the characteristic findings when injected into a rabbit.

The clinical course was absolutely symptom free as regards temperature, pulse, pain, and tenderness, and she left the hospital on the eighth day.

CASE 3.—Almost a duplicate of Case 2 except for a slight fever 100.4° and leucocytosis. Attention was called to the possibility of a gas bacillus being present by the gas bubbles present in the fetus and placenta after expulsion. The abortion was spontaneous at the fourth month and no definite history of interference was obtained from the patient. The temperature came down to normal the next day after the abortion.

CASE 4.—Twenty-two-year-old primipara, three months pregnant, entered the clinic of the University of Iowa with a temperature of 102.4°, pulse 120. She was having severe cramps and was flowing slightly. According to her history, a doctor had induced the abortion by introducing a stick of slippery elm into the cervix four days before. Issuing from the vagina was a bloody discharge which contained gas bubbles, and which gave the characteristic sweetish foul odor. The whole fetus was blown up with gas when extracted. Gram stain of the fetal tissues showed a gram-positive organism and cultures and animal inoculations showed the typical Welch bacillus. The day before entry to the hospital, she had several severe chills and fever. On examination the whole abdomen was rigid and there was marked tenderness in both lower quadrants extending to McBurney's point on the right. There was a tender firm mass in the midline of the abdomen extending to within two fingerbreadths of the umbilicus taken to be the uterus. No fetal movements or heart tones could be elicited. On rectal examination the slippery elm stick could be felt in the cervix, and on pulling on a string protruding from the vagina the stick came out of the cervix. It was about three inches long and a fourth of an inch in diameter.

The patient was transferred to the contagious hospital. Her temperature came down to normal on the fourth day and she made an uneventful recovery.

CASE 5.—Thirty-seven-year-old para ix, pregnant two months, who entered the clinic of the University of Illinois because of a severe heart lesion. The heart was partly decompensated. She was admitted July 2 and was treated for her cardiac decompensation until July 30 when she went into labor spontaneously and aborted in about one hour. There was no history of vaginal examination before she started to abort, and she was in the hospital under observation for twenty-eight days before the abortion started. The possibility that she examined herself vaginally is to be considered. When the fetus was expelled it was found to be emphysematous. This led to culture and smears and animal inoculation which revealed the gas bacillus. She had no temperature previous to or following this abortion and left the hospital the tenth day with no evidence of residual pathology.

CASE 6.—Para i, thirty-three years old, entered the ward September 30, 1931, at 12:15 A.M., with the history that the membranes had ruptured prematurely and

that the cord had prolapsed immediately. The cord was not pulsating but the resident attempted unsuccessfully to replace it in the uterus. The baby was in transverse presentation and an arcuate type of bicornuate uterus was diagnosed. An attempt was made to sustitute a breech for the transverse presentation. Pains started about 8 P.M., twenty hours after admission and became strong the next morning. The cervix dilated slowly and at 1 P.M. an arm prolapsed. On examining the patient, I found the uterus to be ballooned up and very tense. The pains were strong and tetanic in character. There were some bubbles of gas escaping from the vagina on rectal examination. The temperature was 101.8° and the pulse 144. A diagnosis of physometra and gas bacillus infection was made and under deep ether anesthesia version gently attempted. On pushing up the shoulder explosive expulsion of a great quantity of sweetish foul swelling gas occurred. Because version could not easily be accomplished and because of our success with Case 1, it was decided to do a decapitation following the same technic. This was accomplished without apparent injury to the uterus or vagina and the baby slowly and gently delivered. Typical emphysema of the tissues of the baby was revealed. The temperature dropped to 100.4° the next day and to normal on the third day. She left the hospital on October 11 with no evidence of residual infection. The gas bacillus was proved by smears, cultures, and animal inoculation.

An analysis of these cases would seem to show that the gas bacillus may be present in certain cases without giving any striking clinical evidence of its presence. This it seems to me is an important point from the standpoint of unsuspected contamination of our birth rooms and maternity wards. It would seem, however, that there is little danger of starting an epidemic of this type of puerperal sepsis as there seems to be no mention of such in the literature.

The first, fourth, fifth, and sixth cases are examples of physometra and the infection was apparently limited to the fetus and the endometrium. This was evidenced clinically by the failure to develop the hemoglobinuria, hemoglobinemia, and the bronzing of the skin. Unfortunately blood cultures were not made in any of these cases, but according to Bingold they are positive in one-third of such cases. A positive or negative culture would have had little clinical significance. A complete bacteriologic study of the secretions for mixed infection also was not made except that the smears from the fetal tissues, milk cultures, and animal inoculations showed an overwhelming preponderance of the Welch bacillus. This work confirms the experience of Schottmuller, Bingold, Brütt and others of the preponderance of the cases in infected abortions and in patients with prolapsed cord especially where operative intervention has complicated the labor. It would also seem to confirm the opinion of Welch and others that the organisms are largely saprophytic unless they are implanted upon devitalized tissues, and it may be that secondary invaders such as the Streptococcus putridis or colon bacillus are necessary to enhance their virulence.

I feel that it should also be pointed out in this connection that in spite of the fact that it has been shown that the organism can produce inflammatory changes it has not as yet been shown that it fulfills Koch's laws

with respect to the disease. Furthermore its lack of pathogenicity for lower animals is shown by the fact that it is necessary to kill the inoculated rabbits in order to get the organism to grow and produce the characteristic tissue changes. Practically all of the fatal cases reported in which careful bacteriologic examination was carried out showed a mixed infection often with a streptococcus concerning whose virulence there is no reasonable doubt.

Our treatment of these cases was the routine for any infected puerperal case. The head of the bed was elevated, fluids pushed, and one dram of fluid extract of ergot was given four times a day for three days. Serum was not available for the first five cases and was not given in the last case because the clinical course was so benign at the time when the serum was obtained.

TABLE I. RESULTS OF VAGINAL CULTURES

SOURCE	POSITIVE	NEGATIVE	TOTAL	PER CENT POSITIVE
Research and Educational Hospital:				
Prenatal Dispensary	7	138	145	4.82
Gynecological Dispensary	5	10	15	33
Cook County Hospital:				
Incomplete Abortions	5	17	22	29.41
Prenatal Dispensary	8	104	112	7.69
Gynecological Hospital Cases	8	68	76	11.76
St. Vincent's Hospital:				
Prenatal Dispensary	0	13	13	0
Totals	33	350	383	8.61

In order to determine something of the frequency of the gas bacillus in the vagina of prenatal, puerperal, postabortal, and gynecologic cases, a survey was made at the Cook County, Research Hospital and St. Vincent's Home. Gram stain and the reaction in litmus milk were used to denote the presence of the gas bacillus. A few of the cultures found to be positive by these tests were run through rabbits. The results shown in Table I, indicate that the gas bacillus is present in prenatal cases in the smallest number, next in gynecologic cases and most frequently in the infected abortions. This corresponds well with the work of Mouchette who found the bacillus perfringens in 13 out of 18 cases of abortions between the second and fifth month.

Jeannin found 12 positive cultures out of 18 similar cases and 2 of these patients died. In 1 patient there was no fever, in 3 the temperature dropped from 104° to normal as soon as the uterus was emptied, while 2 had a sudden drop to normal after a preliminary rise. He had 3 cases of physometra, 2 patients died.

Rist and Mouchette report 3 cases of infected abortion with very high temperature, but with eventual recovery.

Little reports 9 cases of Welch bacillus infection of the uterus which occurred at Johns Hopkins Hospital, 2 of which were previously reported by Dobbin. Seven of the 9 patients recovered and in most of the details were comparable with my cases. He states however, that no one had cultivated the gas bacillus from the normal vagina up to 1905.

CONCLUSIONS

1. The gas bacillus of Welch is relatively common in septic abortions.
2. Gas bubbles in the vagina of women aborting or in labor should lead to an investigation for the gas bacillus.
3. Its detection and isolation requires only a very simple bacteriologic technic.
4. When diagnosed, these infections should be handled with the greatest care to avoid wounding the soft parts.
5. Such cases should be handled with strict isolation technic during their stay in the hospital.

REFERENCES

(1) *Toombs, P. W.:* Tr. Am. Assn. Obst. & Gynec. & Abd. Surg. **40**: 99, 1927. (2) *Welch:* Johns Hopkins Hosp. Bull. **11**: 185, 1900. (3) *Bingold:* Virchow's Arch. f. path. Anat. **246**: 17, 1923. (4) *Schottmuller:* München. med. Wchnschr. No. 11, 15, 1911. (5) *Heynemann:* Ztschr. f. Geburtsh. u. Gynäk. No. 68, 11, 1911. (6) *Brütt:* Zentralbl. f. Gynäk. No. 33, 1317, 1923. (7) *Welch:* Johns Hopkins Hosp. Bull. **11**: 185, 1900. (8) *Mouchette:* Documents pour servi a l'etude de l'hysterectomie dans l'infection puerperal post abortem, These de Paris, 1903. (9) *Jeannin:* Etiologie et Pathogenie des infections puerperales putrides, These de Paris, 1902. (10) *Rist and Mouchette:* Compt. rend. Soc. de biol. **54**: 363, 1902. (11) *Little, Herbert M.:* Johns Hopkins Hosp. Bull. No. 169, 136, 1905.

1819 West Polk Street.

PUERPERAL SEPSIS: B. WELCHII, FATAL TYPES*

A. F. Lash, Ph.D., M.D., Chicago, Ill.

(From the Department of Obstetrics and Gynecology, University of Illinois, College of Medicine and the Cook County Hospital)

THAT type of puerperal sepsis due to the Bacillus Welchii, (Bacillus perfringens, Bacillus aerogenes capsulatus or Frankel's bacillus), which is usually fatal, is uncommon. When it does occur, the importance of making an early diagnosis and to determine the clinical type in order to intelligently treat the condition, warrants further emphasis and repetition of its characteristic clinical course. Another reason for presenting this paper is the interesting blood chemistry and renal changes observed in two patients who died as a result of this infection, one early and one late.

Wrigley, having observed six fatal cases of puerperal sepsis due to Bacillus Welchii out of a total of sixteen puerperal sepsis deaths from 1922 to 1927 at the

*Read at a meeting of the Chicago Gynecological Society, April 15, 1932.

St. Thomas Hospital, London, was stimulated to study the incidence of these organisms in normal and pathologic pregnancies, labors, and puerperiums. He reported his results in 1930, which were as follows: In 50 women cultured at the beginning of labor, no Bacillus Welchii was isolated. In 100 women with normal pregnancy, labor, and puerperium no Bacillus Welchii was found in the lochia. Therefore, from the literature he reviewed and from his investigations he concluded that Bacillus Welchii was not present in the cervix before or in the lochia following delivery, in cases in which the pregnancy, labor, and puerperium were normal. However, Schottmüller claims that it may be occasionally found in the vagina of normal, healthy women and that autoinfection is possible.

Wrigley also studied 69 women with abnormal pregnancies, labors, or puerperiums. In this series he was able to isolate the Bacillus Welchii from the lochia of 13 patients. Four of these developed a generalized gas bacillus infection. Yet in 16 patients, in whom violent efforts to deliver the child were made, there were no uterine infections with pathogenic anaerobic organisms. Therefore, he concluded that certain conditions must be present for severe maternal infection to occur, such as: The organisms must be introduced into the uterus; the organisms must find there suitable material, namely, dead tissue on which to grow; the infected tissue or fetus must remain in the uterus for a sufficient length of time; and finally, the damaged maternal tissues must be exposed to the infection provided in this manner.

Lehmann and Fraenkel reported in 1924 that they found the gas bacillus in 106 cervical cultures of 580 abortions. There was no further propagation of these organisms since no clinical evidence of infection occurred. In 18 gas bacillus bacteremias, the organisms were found in the blood in 14 instances following curettage, in 2 instances after chills, and in 2 after a rise in temperature.

In a series of 41 puerperal septicemias due to the Bacillus Welchii collected from the literature, Toombs and Michelson made the following bacteriologic observations: The organism was found in the uterus in 19 of the 41 patients. It occurred alone in 9 cases, with Staphylococcus aureus in 3, with Staphylococcus albus in 1, with streptococcus in 1, with Streptococcus pyogenes in 5, with anaerobic streptococcus in 1, and with Bacillus coli in 5. From the blood B. Welchii was isolated in 16 cases being associated in single instances with typhoid bacillus, anaerobic streptococcus, staphylococcus, pneumococcus, and Bacillus coli.

Although Toombs and Michelson collected 190 cases, they selected only 41 cases of puerperal septicemia (Bacillus Welchii), for analysis. From this clinical data they contributed the following facts: 61 per cent of the total number of cases were abortions; the nonabortion group (39 per cent) had many causes for prolonged labor which were active in the first stage in 95 per cent of the cases. The obstetric conditions producing the prolonged first stage also required frequent vaginal examinations and operative procedures. These factors well explained the exogenous source of the bacteria and the favorable conditions for their growth induced by the intrauterine and vaginal manipulations. Therefore, these statistics bear out Wrigley in his conclusions.

The pathology produced by the organism in the puerperal uterus were emphysema of the fetus, puerperal endometritis, physometra, emphysema of the uterine wall and gas bacillus septicemia. If the process remained localized to the ovum or the endometrium and was well walled off, the symptoms were slight and the patient usually recovered even though the organism was found in the blood stream. Serious consequences followed the entrance of the organism into the uterine musculature. Here it grew in the lymph spaces between the muscles and in the lymph spaces

of the vessels because of their poor content of oxygen. Necrosis of the tissues in their neighborhood resulted. Around these areas of necrosis, there was a peripheral edematous zone due to the extravasation of the blood from the necrotic vessels and its subsequent hemolysis by the hemotoxin. Polymorphonuclear leucocytes were repulsed by a leucocidin liberated by the Bacillus Welchii. Through the lymph stream the organisms were discharged to give rise to the picture of gas bacillus septicemia. The bacteria did not multiply in the blood because of its oxygen content but might do so just before death when the oxygen content was greatly diminished as the circulation was failing. Lehmann laid much stress on the renal changes as a cause of death. He believed that the kidney obstruction due to the end-products of the broken-down hemoglobin was a factor. However, Fraenkel believed that the gradual cessation of urinary secretion might be a contributing cause. This mechanism was first described by Cohnheim in 1880. He further stated that gas bacillus infection could occur only in organs or structures having smooth or striated muscle elements and that when gas was found elsewhere it was usually carried there by the blood vessels.

The clinical course of the severe or metritic type of Bacillus Welchii infection begins with early characteristic symptoms. In the 41 puerperal septicemias, the prodromal period was found to occur within forty-eight hours of the inoculation in 70 per cent of all cases and within twenty-four hours in practically 50 per cent. The chief symptoms observed in these patients were pain in the lower abdomen, especially in the abortive group, vomiting, diarrhea, jaundice, or bronzing of the skin with cyanosis, dyspnea with even air embolism symptoms. The jaundice and cyanosis were present in a large percentage of the patients, as early as twenty-four hours after the onset and as late as the eighth day. Emphysema of the skin occurred in only 16.59 per cent of the cases and in only 4.74 per cent of these the emphysema was generalized.

The characteristic observations were: fever, usually high, accelerated pulse, rapid respirations, tenderness over the uterus, and bloody vaginal discharge which was foul in some cases. The urine was usually scanty, brownish red with much debris. Complete examination of the urine disclosed albumin, hyaline and blood casts, methemoglobin, oxyhemaglobin, hematoporphyrin, and hematin. The blood picture showed a marked decrease in the red blood cells and hemoglobin, with an increase in the white blood cells. Lehmann and Fraenkel observed that the red blood cells dropped from 4,200,000 to 2,100,000 and the hemoglobin from 70 per cent to 30 per cent in the course of six hours. The blood serum had a cherry red color and methemoglobin, oxyhemoglobin, and hematin were demonstrable.

Heim emphasized the presence in the blood of pathologic bone marrow cells which he claimed could be observed only in pernicious anemia and gas bacillus sepsis. This association of these two diseases has given rise to experimental studies as those

of B. S. Cornell and Barach and Draper, to determine the possible cause of pernicious anemia in the form of a chronic intestinal gas bacillus infection.

Although Fraenkel maintained that the hemolysis of the red blood cells producing the jaundice was due to the absorption of the toxic products from the necrotic tissues, Ford and Lawrence showed that the hemotoxin liberated by the Bacillus Welchii was the cause of this hemolysis. Their contentions were supported by the work of others (Cornell, Barach and Draper).

The diagnosis could, therefore, be made early on the basis of the history (abnormal labor or abortion), characteristic symptoms and signs. Toombs stated that jaundice which appeared early and progressed rapidly, occurred only in the puerperal infection caused by the Bacillus Welchii. The writer has seen several patients with severe hemolytic streptococcus septicemia present a similar appearance. However, the other characteristic (urinary and blood) changes were absent. The lack of these hematologic and urinary observations would also differentiate drug intoxication, acute yellow atrophy and blood dyscrasias from a gas bacillus infection.

The case histories of the patients observed by me are briefly as follows:

CASE 1.—V. W., a white woman, aged twenty years, entered the Cook County Hospital, December 24, 1926, because of sudden profuse vaginal bleeding which began that morning after some housework, and continued at intervals through the day. She considered herself about six weeks pregnant. She denied that any attempts to abort her were made. Physical examination revealed a young woman, not appearing acutely ill, with a bluish, coppery colored skin, temperature 101° F., pulse 128, and respiration 36. The essential observations were tenderness over the lower abdomen and vaginal bleeding. The cervix was soft, dilated one centimeter; the corpus somewhat enlarged, up and free; the adnexa were free. The urine was black, foul, contained much debris, and gave a strongly positive reaction for albumin. The same observations were present on repeated examinations. The blood picture was R.B.C., 1,050,000; W.B.C., 16,600; hemoglobin 40 per cent. The Wassermann reaction was negative. The blood chemistry determinations were:

	UREA N.	UREA	CREATININE
December 26	97.00	207.58	5.00
January 3	200.00	428.00	24.00
January 7	305.00		14.32
January 8	238.00		20.00
January 21	98.00	208.00	5.00
January 22	206.00		6.79

Bacteriologic study of the uterine secretions and urine revealed Bacillus Welchii. Blood culture was sterile.

The patient remained fairly comfortable, the color of the skin becoming lighter. The temperature varied from 97° F. to 102.6° F. for four days and then became normal. The patient vomited once daily and urinated only a small amount each day. Although recovering from the infection, she became weaker and on the thirtieth day in the hospital she became restless, irrational and then passed into a comatose condition and died.

No autopsy was permitted but with the aid of the pathologist and undertaker, a kidney was obtained for study. Microscopic examination of sections stained with

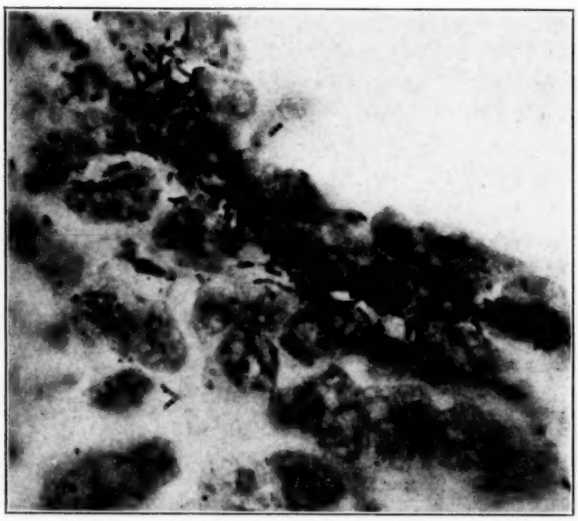

Fig. 1.—Photomicrograph of liver, Case 2, illustrating the Bacillus Welchii in the necrotic liver cells at the edge of a gas bubble. Death seventy-two hours after onset of infection. ×450.

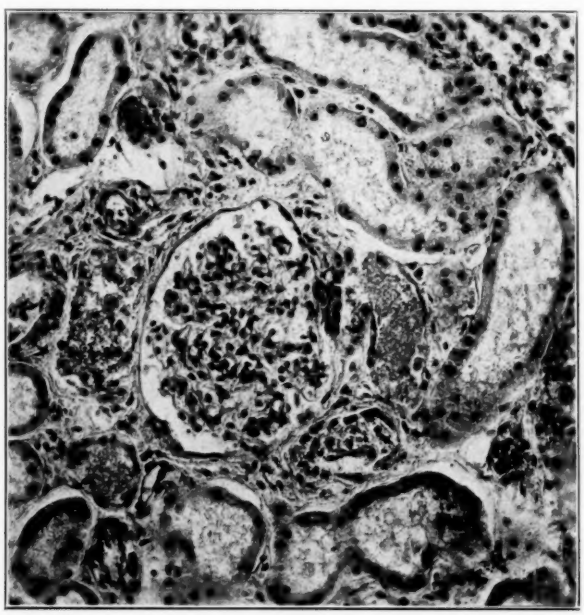

Fig. 2.—Photomicrograph of kidney, Case 2, illustrating the necrotic convoluted tubules, the hemoglobin masses in the tubules and the normal glomerulus. ×140.

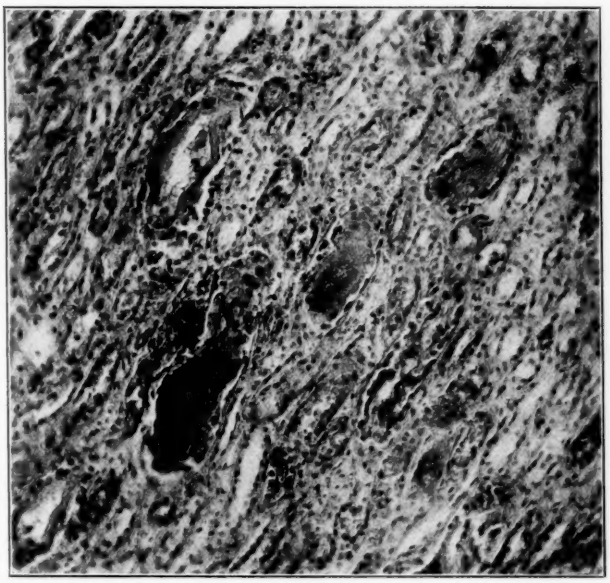

Fig. 3.—Photomicrograph of kidney, Case 2, illustrating the hemoglobin masses in the collecting tubules. ×180.

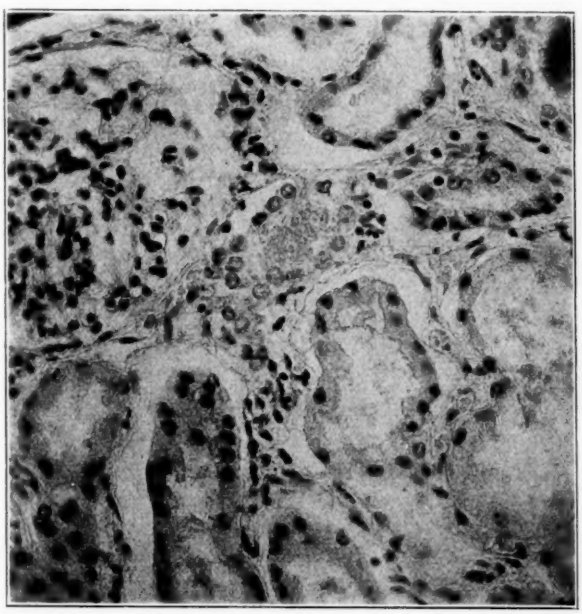

Fig. 4.—Photomicrograph of kidney, Case 1, illustrating the regenerating convoluted tubules with low syncytial-like epithelium. Death one month after onset of infection. ×370.

hematoxylin and eosin show no morphologic change in the kidney as the tubules had regenerated, but a suppurative pyelitis was demonstrated.

CASE 2.—T. H., a white woman, aged forty, gravida viii, entered the Cook County Hospital, March 2, 1931, because of pain in the lower abdomen for two days, vaginal bleeding, chills and fever for one day. Having missed her last menstrual period, she attempted to abort herself with a catheter on March 1, 1931. Physical examination revealed an acutely ill middle aged woman whose skin was a dark copper color and whose temperature was 103° F., pulse 120 and respiration 24. The mucous membranes were cyanotic. The essential observations were, marked tenderness in the lower half of the abdomen, soft, patent cervix, and slightly enlarged corpus. A soft mass was felt in the cervix and under sterile precautions it was removed.

The urine was dark brown and gave a 4-plus reaction for albumin and microscopically showed many white and red blood cells, debris but no casts. The blood count on March 3 was: hemoglobin 70 per cent; R.B.C. 3,350,000 and W.B.C. 42,250. On March 4 the R.B.C. sank to 1,750,000. Blood smears showed 92 per cent neutrophiles, a shift to the left of over 40 per cent with vacuolization of the polymorphonuclear leucocytes and monocytes. Vacuolization was not confined to the older cells but appeared in the metamyelocytes.

Spectroscopic examination of the urine showed neutral methemoglobin and oxyhemoglobin. Blood plasma showed oxyhemoglobin.

The cervical culture yielded B. coli, hemolytic streptococci, and B. Welchii. The placental tissue showed the same bacteria on culture. Blood culture yielded only B. Welchii. A rabbit was injected with the cervical culture, killed and then incubated. A generalized emphysema developed together with a characteristic foamy liver. The blood chemistry showed a nonprotein nitrogen of 80. The clinical course of this patient was characterized by high fever, rapid pulse, marked respiratory difficulty, and anuria until death, forty-eight hours after admission.

The necropsy was performed by Dr. R. H. Jaffe who found essentially: suppurative endometritis and right salpingitis; diffuse fibrinopurulent peritonitis; septic tumor of the spleen; cloudy swelling, icteric discoloration and gas formation of liver; cloudy swelling and bloody discoloration of the kidneys; gas formation in the myocardium, emphysema of the lungs; parenchymatous hemorrhages; gas bubbles in the subcutaneous tissue.

CASE 3.—I. M., a white woman, aged twenty-one years, gravida iii, entered the Cook County Hospital, March 19, 1932, in an extremely toxic condition, being irrational and disoriented. Her history as obtained at a later date was briefly as follows: On March 15, 1932, she inserted a slippery elm stick because she had not menstruated since January 5. Vaginal bleeding began two days later (March 17). Lumbar and abdominal pains associated with nausea and vomiting occurred on March 18. Chills and fever was experienced and the bronzing of the skin began on March 19. Physical examination revealed an extremely jaundiced young woman with cyanosis of the nose, finger and toe tips. The temperature was 104.4° F., pulse 120, respiration 24, and blood pressure 128/74. The tongue was dry and coated. Eye ground examination showed a marked cyanosis of the retina. The chest examination revealed no pathology. The abdomen was flat, firm, and elastic with tenderness over the lower part. Vaginal examination found the cervix soft, patent, down and back; the corpus was enlarged to the size of a six to eight weeks' pregnancy, tender, soft upright and free; the adnexa were not palpable or tender; speculum examination revealed the patent cervix from which exuded dark blood. Smears were made of this cervical secretion and the gram-positive rods of Bacillus Welchii were seen. The urine and blood were immediately examined and the typical cherry red serum and urine were observed.

The diagnosis was made of: Puerperal sepsis, acute metritis, septicemia, Bacillus Welchii.

Treatment was then immediately started. Complete laboratory results were: Cervical culture revealed Bacillus Welchii, Staphylococcus albus, and an indifferent streptococcus; blood cultures taken at different times were sterile.

Urinalysis:

	Color				
3-19-32	Red wine			Acetone 4-plus	Blood 4-plus Much debris
3-20-32	Red wine	20 c.c. in 24 hours			
3-30-32	Straw	340 c.c.	1.010	Albumin 4-plus	Blood 2-plus
4- 3-32	Straw	2140 c.c.	1.010	Albumin 2-plus	Blood 0
4- 9-32	Straw	1700 c.c.	1.010	Albumin 1-plus	

Blood Examination:

	Hemoglobin	R. B. C.	W. B. C.	Polymorphonuclears
3-19-32	65%	5,200,000	46,300	83%
3-20-32	70%	4,910,000	35,600	
3-30-32	70%	3,250,000	13,400	
4- 3-32	50%	3,110,000	11,600	
4- 9-32	55%	3,010,000	8,950	

Blood Chemistry:

	Urea N.	Creatinine	Sugar	CO_2	Lactic Acid	Chlorides
3-19-32	38.29	2.25	64			
3-20-32	86.38	9.2	106			
3-30-32	214.00	17.14	150	74		
4- 4-32	168.12	21.4		30		
4- 9-32	82	3.5	115	52		
				36	26.0	480.0

The above results were only the essential ones given to demonstrate the great changes occurring. A detail laboratory study will be given in a later report.

The treatment consisted of: intravenous serum (polyvalent antigas gangrene serum) therapy, normal saline, 20 per cent glucose and buffer solution intravenous infusion. A detail report of this therapy will be given at a later date.

The clinical course in this patient gradually changed from a semicomatose uremic state to a normal, bright active state so that the patient appears clinically well.

The prognosis of puerperal sepsis, Bacillus Welchii is dependent on the extent of and duration of the infection, the associated bacteria, the early treatment with specific serum and the degree of kidney damage. From the literature it is quite evident that only that type in which the uterine musculature was invaded was serious and proved fatal frequently. One-third of the patients died within forty-eight hours after the infection had taken place and over one-half within four days. My first patient, V. W., was the only patient to have lived so long after the infection. Of course, she recovered from the infection but died from the inability to cope with the conditions present with her damaged kidneys. The outcome was usually fatal when other organisms, especially the hemolytic streptococcus, was also present. In my second patient, T. H., there was an associated peritonitis due to the other organisms. According to Brütt and Lehmann, the mortality might be reduced by early recognition of the disease and extirpation of the uterus. The additional use of the specific serum might be of further value.

The treatment of this type of puerperal sepsis should have for its aims the early administration of specific serum and blood transfusion, to overcome the marked toxemia, and to prevent the extreme blood changes and renal damage; the gentle encouragement and stimulation of renal function by inducing diuresis with normal saline and concentrated glucose infusions. Such radical procedures as hysterectomy which has been used by some with apparent success should only be considered when the patient's condition may allow it and when necessary. Although it would be difficult to set forth rules for hysterectomy, it might be indicated when the appearance of the patient and the findings did not change in spite of liberal administration of the antigas bacillus serum and blood transfusion indicating a source of great toxin producer (infected uterus) and also in the absence of a streptococcal peritonitis. Lehmann used as an indication for hysterectomy, crepitation of the uterus on palpation. Other recent reports (after 1928) of gas bacillus infections are those of Kohl, Baize and Mayer, Ivens and Offergeld.

COMMENTS

The mechanism of infection with the Bacillus Welchii has been studied in animals by DeKruif and Bollman. The primary conditions for infection are established by the various factors described by Wrigley. "The spores introduced at this time are able to germinate, and having passed into the vegetative stage, find in the injured muscular tissue, an admirable medium for the production of the specific toxic substance. This substance, with its diffusibility aided by the outpouring of edema fluid that invariably accompanies infection, is able rapidly to necrose further tissue and so furnish new medium for the growth of the organisms. Finally an area of necrotic tissue sufficient to furnish medium for the growth of an enormous number of organisms is produced. These then are able to produce enough toxin to bring about toxemic death." (DeKruif, et al.). These investigators do not enter into the discussion of the cause of death although the patient has recovered from the toxemia and infection. The same method of extension of the infection occurs in the human body as observed in autopsy studies. There is the additional factor of associated bacteria that comes into play in human infections.

DeKruif, Adams and Ireland have demonstrated also, that different strains of Bacillus Welchii produce toxins of varying degrees of potency. However, they also showed that an antitoxin produced by one strain, was capable of neutralizing the toxins of other strains. This fact is of value therapeutically, because a stock antitoxin may be used in the presence of an infection of any strain of Bacillus Welchii. Ivens reported a favorable report with the serum.

Although the jaundice and even bronzing of the skin does not occur in surgical Bacillus Welchii infections as frequently as in uterine infec-

tions, it does occur. Bingold reported a case presenting the bronze skin, oxyhemoglobinemia and methemoglobinuria, etc., after an infection of the thigh by a hypodermic needle.

The marked renal changes and the anuria must be elucidated since, with the exception of Lehmann and Fraenkel's paper, no previous publication made mention of them. My experience has been especially unique in that an early and late kidney was observed and one apparently recovering with similar clinical pictures. In the early case (seventy-two hours after induction of infection) the typical picture of an acute necrosis of the proximal convoluted tubules associated with obstruction of the tubules with broken-down hemoglobin and cell debris may well explain the anuria. These changes were due to the severe toxemia produced by the Bacillus Welchii toxin and were the same as in all the tissues, especially the liver and heart where the organisms also flourished. In the kidney of the late case (one month after the onset of infection), the tubules had apparently regenerated anatomically but not sufficiently physiologically low syncytial character of epithelium of convoluted tubules and, therefore, uremia was the cause of death.

In the patient who has recovered from the infection and is apparently recovering from the effects of the toxemia, presents some very interesting clinical evidence of renal damage and recovery. The effect of the glucose and buffer solution to produce diuresis is quite evident. The importance of this diuresis is appreciated when one compares it with the diuretic influence of intravenous fluid therapy in the kidney of mercury bichloride poisoning. Hayman and Priestly report a case of mercuric chloride poisoning whose anuria was not effected by decapsulation of the kidneys. Normal saline infusions given intravenously induced an increased urinary output and a drop in blood urea nitrogen from 247 mg. per 100 c.c. to 85 mg. per 100 c.c. in three weeks. The remarkable observation was that there was no detectable phenolsulphonephthalein excretion in two hours at the end of six weeks of treatment when the patient left the hospital against advice. Yet five months later no evidence of impaired renal function could be detected. The chief renal lesion in bichloride poisoning consists in necrosis of the cells of the convoluted tubules. This results in marked impairment of the concentrating power of the kidney and consequent loss of its ability to eliminate waste products in a small volume of urine. A similar renal picture is seen in Bacillus Welchii toxemia. Shapiro in his description of the renal pathology of mercury poisoning states that the tubules regenerate in seven days with extraordinary activity and rapidity. It is, therefore, apparent that the clinical problem as far as the nephrosis is concerned, is to prevent death from acute retention of waste products until time has elapsed for regeneration. Although in the second case the women lived a month after the onset of the infection, she vomited daily and did not receive sufficient fluids. Perhaps these factors and the pyelitis found on microscopic examination prevented a full recovery of the kidneys.

CONCLUSIONS

1. The early diagnosis of Bacillus Welchii puerperal sepsis is essential in order to derive any effect from the polyvalent antitoxin which is on the market. It is usually based on the history of pathologic pregnancy, labor, puerperium, or abortion. The characteristic observations are acyanotic icteric or bronze skin, hemoglobinuria, hemoglobinemia, anuria and Bacillus Welchii in cervical smear and culture.

2. In addition to treating the toxemia, large amounts of hypertonic glucose (for caloric and diuretic effect), buffer solution and normal saline should be given intravenously.

3. Decapsulation of the kidneys does not seem to be a logical operation in view of the pathology.

4. The prognosis depends on the establishment of diuresis and thereby the elimination of the nitrogen waste products until the necrotic convoluted tubules have regenerated.

5. The importance of cervical smears and cultures is again demonstrated in the diagnosis and treatment of puerperal fever.

REFERENCES

(1) *Wrigley, A. J.:* Proc. Royal Soc. Med. **23**: 61, 1930. (2) *Schottmüller, H.:* München. med. Wchnschr. **25**: 1817, 1910. (3) *Lehmann, W., and Fraenkel, E.:* Arch. f. Gynäk. **122**: 692, 1924. (4) *Toombs, P. W., and Michelson, I. D.:* Am. J. Obst. & Gynec. **15**: 379, 1928. (5) *Heim, K.:* Zentralbl. f. Gynäk. **48**: 119, 1924. (6) *Cornell, B. S.:* J. Infect. Dis. **36**: 508, 1925. (7) *Barach, A. L., and Draper, G.:* Proc. Soc. Exper. Biol. & Med. **24**: 411, 1927. (8) *Ford, W. W., and Lawrence, J. H.:* Bull. Johns Hopkins Hosp. **38**: 245, 1917. (9) *Brütt, H., and Lehmann, W.:* Klin. Wchnschr. **6**: 1510, 1927. (10) *Kohl, A.:* Zentralbl. f. Gynäk. **52**: 1324, 1928. (11) *Ivens, F.:* Lancet **1**: 606, 1929. (12) *Baiz, P., and Mayer, M.:* Bull. et mém. Soc. méd. d. hôp. de Paris **53**: 1294, 1929. (13) *Offergeld:* Ztschr. f. Geburtsh. u. Gynäk. **101**: 24, 1931. (14) *DeKruif, P. H., and Bollman, J. L.:* J. Infect. Dis. **21**: 588, 1917. (15) *DeKruif, P. H., Adams, T. W., and Ireland, P. M.:* J. Infect. Dis. **21**: 580, 1917. (16) *Bingold, K.:* Ztschr. f. klin. Med. **92**: 140, 1921. (17) *Hayman, J. M., Jr., and Priestly, J. T.:* Am. J. M. Sc. **176**: 510, 1928. (18) *Shapiro, P. F.:* J. Lab. & Clin. Med. **15**: 961, 1929.

30 North Michigan Avenue.

ABSTRACT OF DISCUSSION

DR. A. F. LASH (closing).—I cannot give any detailed history as to the origin of the serum. The Pasteur Institute was mainly instrumental in producing it, following the World War. The bacteria producing gangrenous lesions are combined to make a polyvalent commercial stock product instead of having an individual product for each strain. This is possible because the antitoxin for one strain will neutralize the toxin of related strains as demonstrated by DeKruif and his workers. It seems that if one of these organisms enters the uterus and remains there long enough under favorable conditions it will grow and produce necrosis and this will enhance further growth of the organisms in the dead tissue and also toxin production.

Another important question is the terminology of puerperal sepsis. As you notice, my title is, "Puerperal Sepsis: B. Welchii, Fatal Types." I think a better picture of puerperal infections is given when a clinical, pathologic and bacteriologic term is used which would rule out a lot of the so-called puerperal infections. Some of the cases Dr. Falls described may be considered merely infections of the fetuses.

A clear mental picture is given when one specifies as follows, the type of infection, puerperal sepsis, acute metritis and toxemia, B. Welchii.

In none of these cases I observed did I notice gas issuing from the vagina or cervix. In two, the vaginal discharges were foul.

The points I tried to bring out are: First, these cases are mistaken because there is no gas to give the clinician the impression that he has a gas infection. Therefore, it is important to remember, the bronzing of the skin, hemoglobinuria and hemoglobinemia, and examining a stained smear from the cervix in order to establish the diagnosis immediately. The next important thing is the use of the specific serum which must be repeated as long as there is evidence of infection. The next thing is dealing with the kidney lesions, by inducing a marked diuresis to remove from the circulation the marked amount of nitrogenous end products produced by toxic changes occurring in the liver and other parenchymatous organs. These cannot be thrown out in a small amount of urine. This can be produced by pushing fluids in the form of intravenous saline, buffer and hypertonic glucose solutions.

DR. FALLS (closing).—Replying to Dr. Bacon as to the percentage of cases in which the organisms are found in the vagina of normal women, it occurred to me that these must be frequently present in women who are otherwise normal. If we are to get patients showing the gas bacillus in a case like the fourth one I reported, who was in the hospital for twenty-eight days suffering from decompensated heart, and who suddenly aborted without any vaginal manipulation, we think that the gas bacillus must have been present before the abortion started.

The only series of cases of normal women who did not show gas bacillus was at St. Vincent's Hospital. These patients come in at about the eighth month of pregnancy. The highest percentage was in the abortions and that carries the same significance as other workers have pointed out. We had 29 per cent, that is one in about three abortions, at the Cook County Hospital. In the prenatal clinic at the County Hospital, which is composed of a large percentage of colored patients, we found 7.69 per cent, while in the prenatal clinic at the Research Hospital, with the same type of individual but a little higher grade and more whites, we found only 4.85 per cent. In the gynecologic department, where the patients are having treatment and where they are living at home and have a normal sexual relationship, we find 33 per cent. Apparently the percentage depends upon the type of patient. If we were to take cultures from the private patients we would probably rarely run into a gas bacillus.

The odor of the bacillus has been referred to frequently. I believe that the odor and gas production depend on the infection in a late stage of the pregnancy. When the fetus is large enough so that gas cannot get out, then the gas will be retained in the uterus and will produce physometra. The odor may depend also on an associated anaerobic gas producing streptococcus, and we may have a different odor due to two forms of gas being present at the same time.

As to the virulence of this strain, it has been found that growing gas bacillus with other organisms changes its virulence and, if it is found with streptococcus, it may not be the streptococcus that causes all the damage, but the presence of streptococcus produces an anaerobic condition for the gas bacillus to grow and enhances the production of gas. It is quite evident in these cases that most of them are mixed infections. Because the gas bacillus is easy to cultivate, it is apt to overgrow. The streptococcus may be very difficult to cultivate and gas bacilli may overgrow the anaerobic streptococcus and be given the credit for producing death. It is quite significant to my mind that the gas bacillus has not fulfilled the laws of Koch with respect to this disease, and that no one has described an epidemic of this infection.

ENTEROUTERINE FISTULA*

With a Review of the Literature and Report of a Case Studied Radiologically

W. C. Danforth, B.S., M.D., F.A.C.S., and James T. Case, M.D., D.M.R.E. (Camb.), F.A.C.S., Evanston, Ill.

(From the Departments of Obstetrics and Gynecology and of Radiology of Northwestern University and of the Evanston Hospital)

A SURVEY of the literature indicates that enterouterine fistulas are not common. We have found reports of 58 cases during the past two hundred years in which a fistulous communication existed between the bowel and the uterus. Le Jemtel reported a case seen by him in 1907 and collected 21 others previously reported. He divides the enterouterine fistulas etiologically into three classes:

1. Ruptures of the uterus, either spontaneous or produced during labor.
2. Peritonitis (a) pathologic puerperium, (b) appendicular.
3. Cancer.

The explanation of Le Jemtel as to the mechanism of the production of the fistulas seems quite sufficient.

1. "By strangulation. Most frequent in uterine rupture. The intestine enters a more or less large tear, the uterine contractions strangulate it and the changes which follow are those which are found in a strangulated hernia. Gangrene, establishment of protective adhesions, and escape of intestinal contents by the genital canal.

2. "By the simultaneous or consecutive opening of an abscess in the intestinal and uterine cavities. Whether it be a peritonitis following puerperal infection or an infection following appendicitis, the phenomena are identical. The abscess opens but the inflammatory changes have already united the uterus and the intestine, their walls are thinned, without resistance and the communication is easily explained.

3. "In cancer of the uterus the lesion is about the same, cancerous projections springing from the uterus, in incessant contact with the bowel coils, at the level of the pouch of Douglas, produces an irritation which, little by little produces adhesion. The cancerous growth infiltrates the intestinal wall, ulceration and loss of substance occurs between the intestine and uterus and fecal matter escapes by the genital canal."

The fistulas of carcinomatous origin are apparently far rarer than those following trauma. The literature of recent years shows a lessening frequency of severe obstetric injury followed by enterouterine fistula. We have been able to find 37 cases following injury, 14 cases as a result of inflammatory processes or congenital lesions, and *seven* cases of a carcinomatous fistula. Our case makes a total of eight reported enterouterine fistulas of carcinomatous origin.

The Location of the Fistula.—In Le Jemtel's collected series there was one case each of a communication between the sigmoid and the uterus

*Read at a meeting of the Chicago Gynecological Society, April 15, 1932.

and between the cecum and the uterus. He reports three others in which the exact location of the fistula in the bowel was not known. In all the other cases in his series the seat of the opening in the bowel was in the small intestine. The seat of the opening in the uterus, if the fistula follows an inflammation, is usually in the fundus. A traumatic fistula is located at the point of injury to the uterine wall. As Le Jemtel points out, the size of the fistulous opening varies. A laceration produced by the forceps in which intestine becomes strangulated is much larger than the opening produced by the opening of an abscess, which has formed between two structures, which are firmly adherent.

Neugebauer of Warsaw, in 1902 collected 31 cases of enterouterine fistula. A number of Neugebauer's cases are also reported by Le Jemtel. In 2 of the cases collected by him the fistula was found between the stomach and the uterus, in 9 cases uterorectal, in 3 cases between the uterus and the sigmoid, and in one case between the uterus and the transverse colon. In 12 cases the small intestine communicated with the uterine cavity. In one case an opening into the uterus was found from both the small bowel and the sigmoid.

The treatment of fistulas of this variety is dependent wholly upon the cause. In those resulting from invasion of the bowel wall, by carcinoma originating in the fundus of the uterus, there is ordinarily little hope of surgical relief. In the case here reported the carcinomatous involvement was already so extensive that no possibility existed of excision of the involved structures. When a fistula between the bowel and the uterus is found which is a result of trauma, laparotomy may be done with the hope of freeing the bowel from the uterus and closing the openings in the bowel and uterine fundus. A resection of the intestinal loop may be needed. This was done in several of the cases collected by Neugebauer with success in some of them. In one case, among those collected by Neugebauer, the fecal discharge was caused to stop by surgically closing the external os of the uterus.

CASE REPORT

Mrs. R., aged fifty-eight, entered hospital, October 28, 1931. Married twenty-five years. No children. Menopause occurred normally at forty-five. No serious illnesses until onset of present trouble. At ten years of age she states that she had abscess in rectum which evacuated itself spontaneously. About two years ago had considerable backache. She has been treated by medical men at times in past two or three years for colitis.

About two weeks ago a discharge began through the vagina of material which evidently came from the bowel, food remnants were seen and the discharge was not voluntarily controllable. This has continued daily until the time of admission. Examination after admission revealed a well nourished woman. Blood pressure 100/60. Heart and lungs normal. Physical examination essentially normal.

The vagina was normal. During the examination a sudden flow of material, obviously of intestinal origin, containing food remnants, and fluid in character, occurred. The cervix was small, pointed backward, mobility somewhat diminished. The fundus was irregular in shape, a mass palpable posteriorly and a little to the left, mobility diminished. The adnexa were negative.

As no rectovaginal fistula was found to account for the presence of the intestinal

contents in the vagina, a speculum was introduced which definitely showed that the fluid noted above came from the cervix. A uterine sound passed from the cervix, passed up through the uterus and apparently to a point beyond where the fundus of the uterus should be. Its withdrawal was followed by a small amount of bright red fluid blood.

Proctoscopic Examination.—(By Dr. Charles E. Pope.) The distance observed, 14 to 15 cm. There is an anterior sigmoid fixation and a sense of a tumor mass. No sigmoid or rectal blood. Sigmoid shows marked obstruction from angulation at the point of apparent adhesions to the uterus and about 14 cm. from the rectal opening.

Radiologic Examination.—(By Dr. James T. Case.) The patient was placed in the dorsal position, a vaginal retractor inserted, and the vagina cleansed of fecal matter. An attempt was made to sterilize the vaginal tract with mercurochrome.

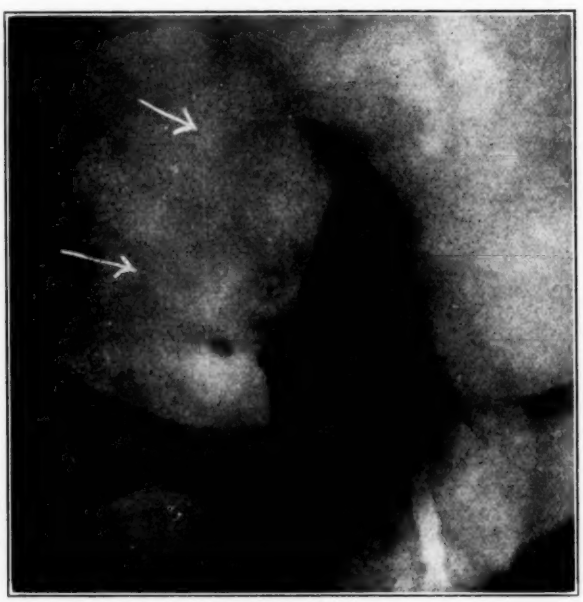

Fig. 1.—Uterine cavity after injection of 8 c.c. of iodized oil. Note the filling defect on the right side of the fundus, with irregular contours indicating a tumor of the fundus intruding itself on the uterine cavity. None of the opaque material had passed into the tubes or through the fistula.

The cervix was conical, and apparently normal. A cannula was introduced into the cervix for a distance of five centimeters. Everything being in readiness and the appropriate instruments at hand, 15 c.c. of opaque oil was introduced into the uterine cavity with moderate pressure, and control films exposed. These films showed a deformed uterine cavity (Fig. 1), there being a defect of filling in the right anterior portion of the fundus in the neighborhood of the right cornu, involving most of the right side of the fundus, and being very suggestive of a neoplasm. These films showed that as yet no opaque material had passed through the tubes. We accordingly prepared the patient a second time, and injected more opaque oil, after which further roentgenograms demonstrated that the oil had passed into the cecum (Fig. 2), apparently by way of the terminal ileum, although the entire pathway was not demonstrable. We assumed that the communication had been with the terminal ileum not far from the cecum, because the passage from the uterus to the cecum and ascending colon had occurred with such rapidity. The appendix at this time was not visualized, and anyhow the distance between the uterine fundus and

the rather high cecum was too great for the communication to have occurred by way of the appendix. We accordingly concluded that the lesion in the uterus was a carcinoma, and that there had occurred a spontaneous communication with the terminal ileum near the ileocecal junction. Another roentgenogram twenty-four hours later showed the opaque oil practically all in the colon, filling it from the cecum to the splenic flexure inclusive (Fig. 3). The appendix was visualized at the time, and further confirmed the conclusion that the fistula had not involved it. A few drops of the opaque oil were now noted in the true pelvis, indicating that the left tube was patent.

In view of the septic nature of the contents of the uterus, we felt some anxiety about the passage of some of the potentially infected oil into the peritoneal cavity, for it is well known that even the high content of iodine in the opaque oil does not render it antiseptic; but we reflected that this patient had already withstood the

Fig. 2.—The same after further injection of opaque oil. Note the ragged contours of the filling defect in the right side of the fundus uteri, still further confirmatory of the malignant nature of the tumor; some opaque oil above the fundus, having passed through the left tube; and a considerable quantity of opaque oil in the region of the cecum, with a considerable gap between it and the uterine fundus, leading to the assumption that the connection was by way of small intestine rather than the appendix.

presence of a fecal fistula for some time, and was probably well protected against B. coli infection.

Operation.—November 4, 1931. On opening the abdomen, the terminal coil of ileum was found attached to the fundus of the uterus at a point about eight inches from the cecum. The entire fundus was greatly enlarged, hard, indurated, and nodular, and this indurated feeling extended over into the wall of the ileum. On the left side of the fundus of the uterus, just below the point of attachment of the ileum the sigmoid was also firmly attached, and this apparently also was invaded with the same growth. This growth extended out backward and laterally into the parametria on both sides. There were apparently enlarged retroperitoneal lumbar glands. The entire mass was of slight mobility, and unquestionably was a malignant affair, probably primary in the uterus.

Median incision was made, sufficient in length to allow of easy exploration. As

the operation was so extensive as to be accompanied by grave danger, and because even an extensive operation would still leave retroperitoneal carcinomatous involvement and probably carcinoma in the parametria, it was decided to do nothing, but to close the abdomen without any operative attempt being made. The usual closure was done with stay sutures of braided silk, layer sutures in the abdominal wall and running silk in the skin. No laparotomy pads were introduced. No drainage. No anesthetic complications.

The case which we present is of interest in that it is the first one in which radiologic study has demonstrated the site of the fistulous opening in the bowel. It is true that in most cases the location may be determined

Fig. 3.—Film showing disposition of the opaque oil twenty-four hours later. There is now no doubt about the identity of the visualized loops of colon. Appendix visualized, evidently not involved in the fistulous passage.

with approximate accuracy by the character of the discharge and possibly by the presence of excoriation upon the vulva. It is also a fact that in cases of carcinomatous fistula the fistulous opening is merely an event in the later history of a case of carcinoma of the uterus, and that attempts at surgical relief are likely to be useless. It has been of interest, however, to demonstrate that localization of such a lesion radiologically is possible, especially as it had not been done before. Hysterography as a routine procedure in carcinoma of the uterus would not be a desirable procedure. The possibility of forcing particles of carcinomatous tissue through the tubes into the peritoneal cavity is to be feared, and Sampson has drawn attention to the possibility of migration of malignant cells from the uterine cavity into the abdomen. Inasmuch

as in cases in which a carcinomatous fistula already exists, as much secondary invasion has already occurred as is possible, and as the presence of the fistula itself, allowing the passage of the lipiodal from the uterine cavity into the bowel, reduces the danger of the fluid being driven through the tubes, it seems a safe procedure.

REFERENCES*

Abuldadze: Soc. Obst. Gynec. de Kyjew, March 26, 1897. *Amann, J. A.:* Verhandl. d. deutsche Gesellsch. f. Gynäk. **8**: 463-465, 1899. *Ashwell:* A Practical Treatise on the Diseases Peculiar to Women, London, 1845, 520. *Bidder, A.:* Verhandl. d. deutschen Gesellsch. f. Chir. **14**: 52-61, 1885; Arch. f. klin. Chir. **32**: 606, 1885. *Bonet, Th.:* Sepulchretum, Vol. 1, Part ii, Book 3, p. 188, Observation xiv. *Breitzmann:* Med. Zeitung Preussichen Verein, No. 26, p. 122, 1844. *Buzzell:* North American Medico-Chirurgical Review, 901, 1860. *Casamayor, J. A. L.*: J. hebdomadaire de médecine **4**: 170, 1829. *Colman:* Med. Physical J., London **2**: 262, 1799. *Cruveilhier:* Traité d'anatomie pathologique générale **2**: 533, 1852. *Cursham, G.:* London med. Gaz. **13**: 943-946, 1834. *Dahlmann:* Arch. f. Gynäk. **15**: 122, 1879. *Dauriac:* Société anat. de Paris **5**: 241, 1891. *Davey, J. G.:* Lancet **2**: 236, 1835-1836. *Davis, David D.:* The Principles and Practice of Obstetrical Medicine, **2**: 1072. *Demarquay:* Gaz. Méd. de Paris, p. 341, 1867. *Dianoux:* Bull. et mem. Soc. Anat. 71, 1875. *Dunn:* Trans. Obst. Soc. **9**: 65, 1868. *Duparque:* Geschichte der Durchlöcherunger, Einrisse und Zerreisungen des Uterus, Vagina und des Perinaeums, Deutsch von Nevermann, p. 4, 1838. *Einbeck, A. T.:* St. Louis Courier of Medicine **4**: 122, 1880. *Forget:* Gaz. med. de Paris. p. 641, 1851. *Goth:* Arch. f. Gynäk. **32**: 287. *Gouin, Gaston:* These de Paris, 1903. *Graves, W. P.:* Am. J. Obst. **57**: 353-354, 1908. *Gussenbauer:* Rapport de la Clin. Chirurg. de Liège, Obs. **186**: 210, 1876-8. *Hamon:* Rev. méd.-chir. d. mal. d. femmes **7**: 455, 1885. *Heine:* Langenbeck's Arch. 1869. *Hufeland:* J. der Prakt. Arzneikunde **9**: 131. *Husson:* Bull. de la Soc. Anatom. **9**: 80, 1834. *Jones:* Dublin J. **26**: 162, 1845. *Kaufmann:* Arch. f. Gynäk. **28**: 407. *Kiwisch:* Klin. Vorträge über Pathologie u. Therapie des Weiblichen Geschlechtes (Edition Scanzoni) **2**: 759, 1857. *Kuthe, J. P.:* Nederl. Tijdschr. v. Geneesk. **21**: 1889. See Répert. univ. d'Obst. et de Gynéc. 466, 1889. *Lambron, recorded by Deneux:* These de Paris, No. 278, p. 66, 1804. *Le Jemtel:* Arch. prov. de chir., Paris **18**: 628-654, 1909. *MacKeever:* Practical Remarks on Laceration of the Uterus and the Vagina, With Cases, London, 41-58, 1824. *MacKeever, Thos.:* Trans. Assn. of Fellows and Licentiates of the King's and Queen's College of Physic in Ireland, xxxx, **3**: 280, 1820, Dublin. *MacKeever:* Trans. of the Assn. of Fellows and Licentiates of the King's and Queen's College of Physicians in Ireland **3**: 280. *Martin Aguilar, Juan (Granada):* Gaceta médica de Granada **23**: 427-431, 1905. *Maslieurat-Lagémard, G. E.:* Arch. gén. de méd. **12**: 452, 1836. *Meinert:* Verhandl. d. deutsche Gesellsch. f. Gynäk., VI. Kongress, Leipzig, p. 283, 1895. *Morgan:* Western J. M. Sc. **9**: 521, 1845. *Myasnikoff, V.:* Med. Obozr., Mosk. **1**: 503-506, 1898. *Neifeld, E. J.:* Primitiae phys. med. (etc.) Zullichoviae **2**: 191-193, 1750. *Neugebauer, F. L.:* Rev. de gynéc. et de chir. abd. **2**: 581-614, 1898. *Pennel:* France médicale **2**: 649, 1881. *Peraire:* Gynécologie **16**: 101, 1912. *Petit, L. H.:* Ann. de gynec. **17**: 401, 1882; **19**: 14, 90, 290, 353, 431, 1883; **20**: 22. *Raczynskij:* J. d'Obst. et de Gynéc., Saint Petersburg 1201, 1892 (Russian). *Radford:* Trans. Obstet. Soc. of London **8**: 199, 1866. *Roessler:* Berl. klin. Wchnschr. 440, 1879. *Rosenthal, J.:* Gazeta Iekarska **13**: 581-589, 1893. *Routier:* Soc. de Chirurgie, June 10, 1896. *Scharlau:* Monatschr. f. Geburtsh. u. Frauenkrankh., Berlin **27**: 1, 1856. *Schenck, Johann:* Observationum, Libri VII, Frankfort, 1665, Edition Joh. Beyer, Liber IV, p. 650, Observ. iii. *Schenck, W. L.:* Trans. Med. Soc. Kansas **13**: 102, 1879. *Simon:* Monatschr. f. Geburtsh. **14**: 439, 1859. *Simpson:* Edinburgh M. J. **11**: 875, 1855, cited by Neugebauer. *Simpson:* Clinical Lectures on Diseases of Women, Edinburgh, 1872, p. 144. *Skinner, W. T., and Ellis, Chas. M.:* Philadelphia Med. Times, p. 568, 1879. *Thurman:* Lancet **2**: 190, 1836. *Ulrich:* Monatschr. f. Geburtsh. u. Frauenkrankh. **10**: 173, 1857. *Wageminge:* Nederlandsche Lancet **2**: No. 478, 1840; see Kulenkampff; Kiel, p. 107, 1874. *Wood:* London Med. Repository **15**: 450, 1822.

636 CHURCH STREET.

*Some of the references which follow are copied from Le Jemtel, and have not been verified, because of inaccessibility of the volumes referred to.

REPORT OF A CASE OF CONGENITAL DEFECT IN THE DIAPHRAGM*

CHARLES NEWBERGER, S.B., M.D., CHICAGO, ILL.

(From the Department of Obstetrics, Mount Sinai Hospital)

MRS. J. G., thirty-two years of age, married eight years, presented herself in the Prenatal Clinic on September 16, 1931, in the sixteenth week of her first pregnancy.

Her father died in 1917, at the age of sixty, in the war zone; her mother, six sisters, and three brothers are living.

She had had measles, diphtheria, scarlet fever, whooping cough, and an operation for hemorrhoids. In January, 1927, she was seen in our out-patient medical

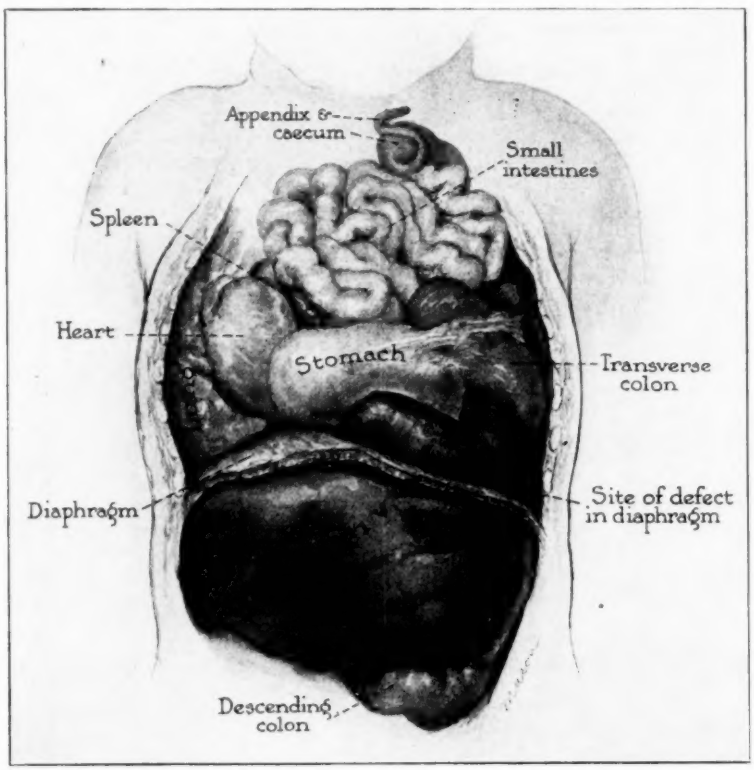

Fig. 1.—Showing arrangement of viscera on opening chest and abdominal cavities.

clinic for anorexia, loss of weight, weakness, and cough; she was poorly nourished, weighed 80 pounds, and had suspicious findings in the apex of the right lung, posteriorly. She was placed under observation and treatment, and gradually gained slightly in strength, and about fifteen pounds in weight.

Her menses began at seventeen years of age, were irregular in type, twenty-nine to thirty-five days apart, of two or three days' duration, scanty in amount, and painful.

*Presented before the Chicago Gynecological Society, April 15, 1932.

She was married in 1924, and in August, 1929, consulted our gynecologic department for her sterility.

Her last menstrual period was May 27, 1931, and she was scheduled to deliver March 2, 1932. On her first visit, she complained of occasional headache, dizziness, nausea, vomiting, edema, and numbness of her hands. She weighed 98 pounds, and appeared rather poorly nourished. Her pelvic measurements were: interspinous, 25 cm.; intercristal, 28 cm.; intertrochanteric, 30 cm.; external conjugate, 18 cm. Vaginally, there was evidence of general contraction of a moderate degree, with a diagonal conjugate of 11 cm. Wassermann was negative; sputum was negative; red blood cell count was 4,800,000; hemoglobin was 75 per cent. She was seen regularly during the prenatal period, the blood pressure averaging 120/60, the urine showing a trace of albumin on two examinations. At eighteen weeks, she was treated for chronic otitis media, and at thirty-two weeks for a mild grippal

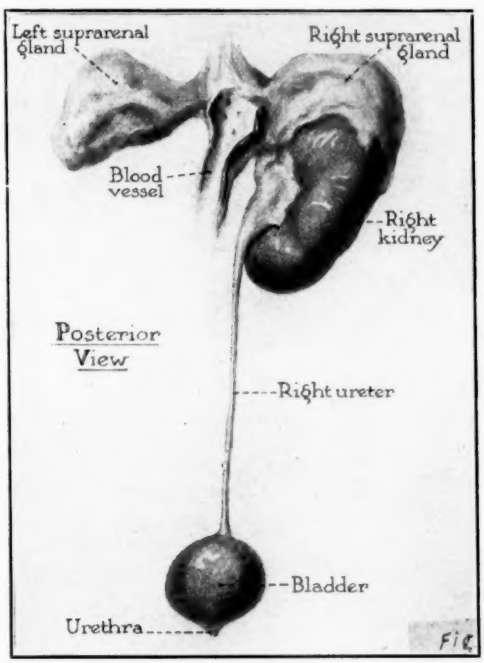

Fig. 2.—Showing absence of kidney and ureter on left side.

infection. On February 24, a week before term, she weighed 122 pounds, having gained 24 pounds in twenty-three weeks. On March 7, 1932, being then five days overdue, she was admitted to the hospital for observation. The fundus was found eight fingerbreadths above the umbilicus, the fetus was in O. L. T. position, head floating, fetal heart rate 140, blood pressure 88/40, and a trace of albumin was found in the urine. X-ray showed a baby of normal contour.

Pains set in March 9, at 5 A.M., and soon were strong and five to six minutes apart. Rectal examination at 5:45 A.M., revealed only 1 cm. dilatation, with the head floating; at 10:15 A.M., dilatation was 3 cm., station of the head still high; at 1:15 P.M., the findings were the same. Because of the generally contracted pelvis, the signs of disproportion, the failure of engagement of the head after eight hours of good pains, the past medical history, and the seven years of sterility, with the x-ray showing a normal baby, and the fetal heart rate 140 and of good quality,

low cervical cesarean section was done. A male baby was delivered without difficulty. It gave a few inaudible gasps, and, in spite of the usual treatment for asphyxia, which was kept up for more than an hour, and included the tracheal catheter, artificial respiration, hot bath, adrenalin, lobelin into the cord, and oxygen, it could not be resuscitated. While attempting rhythmic compression of the heart and lungs, it was noted that the heart beat, which continued for about thirty minutes after birth, was present on the right side of the chest, suggesting the possibility of either diaphragmatic hernia, or situs inversus viscerum.

Autopsy was performed three hours after birth, by Dr. I. Davidsohn, who reported as follows:

Macroscopic.—A white male newborn, 48 cm. long, and weighing 3365 gm. The head was perfectly round; there was no evidence of moulding or compression. The hair was well developed. The pupils were equal and measured 3 mm. in diameter.

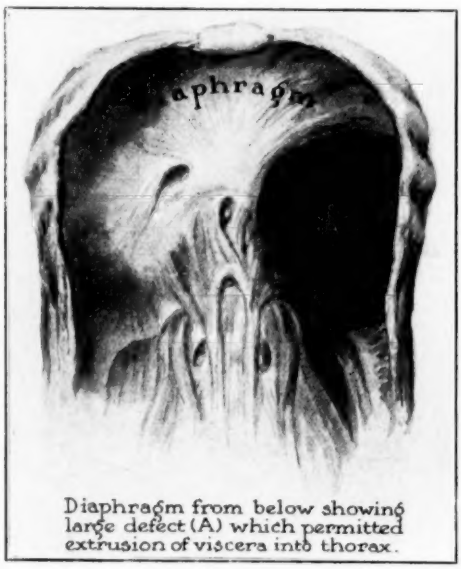

Fig. 3

The lips were markedly cyanotic. The ears, nose, mouth, and neck, showed no abnormalities. No rigidity was present; slight lividities presented posteriorly. The umbilical stump measured 4 cm. There was no evidence of hemorrhage, or of adenopathies. Both testicles were in the scrotum.

Abdominal cavity.—The liver filled out at least four-fifths of the peritoneal cavity. There was no free fluid. The right diaphragm was pushed downward; the left diaphragm was preserved only in its anterior and lateral portions, measuring about 2 cm. in the widest diameter, and surrounding a large defect through which one-half of the left lobe of the liver, the spleen, the stomach, the pancreas, the entire small intestine, and the major portion of the large intestine had entered the chest cavity pushing the heart and left lung into the right half of the chest cavity. The resulting position was such that the right lung was compressed and covered by the heart, which was lying on the diaphragm. Next to the heart and on its left side was visible a portion of the spleen covering up the left lung. Then came the large intestine, the appendix being visible in its entire length in the upper part of the neck.

Thymus.—Weighed 15 gm. and appeared somewhat enlarged; its consistency and

appearance were normal. *Heart:* the muscle and valves showed no abnormalities. *Lungs:* right, was atelectatic; otherwise it appeared normal; left, was distinctly hypoplastic, being about the size of the middle lobe of the right lung. *Spleen:* appeared large, measuring 4 by 3½ by 1½ cm. *Liver:* measured 12½ by 8½ by 4½ cm. It appeared very much enlarged; its consistency was soft, its cut surface was normal. *Pancreas, stomach, small intestine,* and *adrenals:* showed no abnormalities. *Mesenteric lymph nodes:* were prominent, but not enlarged. *Large intestine:* was filled with meconium. *Right kidney:* measured 4½ by 3 by 1½ cm. Appeared somewhat enlarged; its cut surface, and the right ureter were normal. *Left kidney* and *left ureter:* both were absent. *Urinary bladder:* contained only one, the right, ureteral orifice; otherwise normal. *Brain:* the external appearance, as well as the cut surface of the formalin-fixed brain presented no abnormalities.

(Note: The organs were left together and therefore not weighed.)

Microscopic.—Sections of the liver, thymus, and spleen showed no abnormalities.

Gross Anatomical Diagnosis.—There was a congenital defect on the left side of the diaphragm, with ectopia of the stomach, pancreas, small and major part of the large intestine, spleen, and portion of liver into the chest cavity, with displacement of heart and left lung into the right half of the chest. Hypoplasia of the left lung. Aplasia of the left kidney, and of the left ureter.

Comment: The x-ray plates were reexamined, but they were found to be of no value in suggesting the presence of the abnormalities. This case also illustrates the simultaneous occurrence of more than one fetal anomaly, and, further, it emphasizes the need for insistence of autopsy in cases of stillbirths. If this baby had been delivered vaginally, and no autopsy performed, its death would have been charged to the obstetric judgment which attempted such a delivery under the existing conditions.

310 South Michigan Avenue.

A CASE OF LEUCOPLAKIA OF THE VULVA FOLLOWED BY CARCINOMA DEVELOPING IN THE SCAR OF THE VULVECTOMY*

Dr. E. W. Fischmann, Chicago, Ill.

At the last meeting Dr. Culbertson presented a case of leucoplakia of the vulva that showed carcinoma in the same section. I would like to report a case of leucoplakia of the vulva which was followed two years later by carcinoma developing in the scar following vulvectomy for the leucoplakia. This patient presented herself in January, 1930, because of intense itching of the vulva of one year's duration. She was then sixty-eight years of age. At that time the vulva showed considerable loss of pubic hair, a great many scratch marks, a number of bluish-white plaques, and a parchment consistency of the skin with marked atrophy of the labia minora and labia majora and gapping of the external urinary meatus. Because the patient preferred surgical treatment, vulvectomy was done. She was relieved of the itching and was fairly comfortable until January, 1932, when she presented herself again because of bleeding from a small growth about 3 mm. in diameter and about 6 mm. above the level of the skin. This tumor was rather friable, but she had no inguinal adenopathy. At this time we resected the tumor and some of the surrounding area and did a plastic; the inguinal glands were also removed by Bassett's operation.

*Described at a meeting of the Chicago Gynecological Society, April 15, 1932.

Society Transactions

AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS AND ABDOMINAL SURGEONS

FORTY-FIFTH ANNUAL MEETING

French Lick Springs, Ind., September 12, 13, and 14, 1932.

The following papers were presented:

New Methods of Study Applied to Maternal Mortalities in the Hospital. Dr. A. J. Skeel, Cleveland, O. (See page 187.)

Report of a Case of Myoma of the Anterior Wall of the Vagina. Dr. F. Reder, St. Louis, Mo. (Published in the current volume of the Society's Transactions.)

A Study in Correlation of the Sedimentation Test, Filament-nonfilament, and the White Cell Count in Gynecology. Drs. H. W. Yates, D. M. Davidow, E. Putman, and F. Ellman, Detroit, Mich. (See page 203.)

Placenta Accreta. Dr. E. L. Dorsett, St. Louis, Mo. (See page 274.)

Some Observations on Effects of Sympathetic Ganglionectomy of Certain Intestinal Conditions. Dr. F. S. Wetherell, Syracuse, N. Y. (Published in the current volume of the Association's Transactions.)

The Legal Responsibility of the Gynecologist. Dr. E. J. Ill, Newark, N. J. (Published in the current volume of the Association's Transactions.)

Some Phases of the Toxemias of Pregnancy. Dr. B. Solomons, Dublin, Ireland. (See page 172.)

The Relationship Between Exogenous Throat Streptococci and Puerperal Infections. Drs. F. Kellogg, and A. T. Hertig, Boston, Mass. (See page 213.)

Injury to Ureters, Including Accidental Ligation During Pelvic Operations. Dr. Q. U. Newell, St. Louis, Mo. (See page 220.)

Prevention and Control of Morbidity and Mortality From Puerperal Infection by State or Municipal Supervision and Inspection. Dr. C. S. Bacon, Chicago, Ill. (See page 194.)

A Report of the End Results of Five Hundred Fifty-Four Consecutive Hysterectomies. Dr. L. E. Phaneuf and Dr. M. O. Belson, Boston, Mass. (See page 262.)

The Qualifications of the Specialist. Dr. W. T. Dannreuther, New York, N. Y. (See page 165.)

Uterine Cancer and Its Treatment by Radium. Dr. A. P. Leighton, Portland, Me. (Published in the current volume of the Association's Transactions.)

Foreign Bodies Left in the Abdomen After Operations. Dr. J. P. Greenhill, Chicago, Ill. (See page 231.)

Sigmoidouterine and Vesicouterine Fistula as a Complication of Childbirth. Dr. W. C. G. Kirchner, St. Louis, Mo. (See page 241.)

Multiple Dermoids of the Ovary. Dr. J. R. Miller, Hartford, Conn. (See page 252.)

Prolapse of the Uterus. Drs. W. A. Coventry, and R. J. Moe, Duluth, Minn. (See page 257.)

CHICAGO GYNECOLOGICAL SOCIETY

STATED MEETING APRIL 15, 1932

Report of a Case of Congenital Defect in the Diaphragm. Dr. Charles Newberger. (See page 306.)

A Case of Leucoplakia of the Vulva Followed by Carcinoma Developing in the Scar of the Vulvectomy. Dr. E. W. Fischmann. (See page 309.)

Enterouterine Fistula, With a Review of the Literature and Report of a Case Studied Radiologically. Dr. W. C. Danforth and Dr. J. T. Case. (See page 300.)

Endometritis and Physometra Due to the Welch Bacillus. Dr. F. H. Falls. (See page 280.)

Puerperal Sepsis: B. Welchii, Fatal Types. Dr. A. F. Lash. (See page 288.)

Dr. William P. Graves, of Boston, Emeritus Professor of Gynecology, Harvard Medical School, and a member of the Advisory Editorial Board of the Journal, died on January 25, 1933, at the age of sixty-three.

A more extended obituary notice will be published in the March issue.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Sterility and Sterilization

Moench, G. L.: Methods of Examining Sterile Couples, Monatschr. f. Geburtsh. u. Gynäk. **90:** 150, 1932.

The investigation of sterile couples must be carried out with great care. The entire life history of both husband and wife from the time of birth on must be studied carefully. This study should include the mode of life, the diet, the frequency of coitus, etc. The man is more often responsible for sterility than is usually realized. The presence of motile spermatozoa is no indication that a man is normally potent. Moench thoroughly studied the morphologic and biometric characteristics of sperm and he found that a normal man does not have more than 19 to 20 per cent of abnormal sperm heads and that the coefficient of variability as determined by the curve of the lengths of the sperm heads does not exceed 11 to 11.5 per cent. In no case of sterility should it be taken for granted that the male is capable of fertilization. Before any manipulation such as a tubal patency test, dilatation of the cervix, curettement, operation for retroflexion, etc., is practiced on the woman, the man should be examined even though he may have procreated children with another woman or even with the same one.

J. P. GREENHILL.

Rubin, I. C.: The Rôle of Appendicitis in the Etiology of Female Sterility, Monatschr. f. Geburtsh. u. Gynäk. **92:** 161, 1932.

In Rubin's series of 3,143 cases of sterility there was a history of appendectomy in 465 cases or 14.7 per cent. Almost 75 per cent of the latter patients had been sterile for more than three years. Anticonceptional methods were used by only 10.3 per cent of all these patients hence this factor plays a very small rôle in sterility.

Among the 465 cases, there were 130 cases or 28 per cent of relative sterility. Pregnancies occurred in 48 before and in 82 after the appendectomy and almost half of the women who conceived after the operation aborted.

In 55.9 per cent of the cases the appendix was removed before and in 43.1 per cent after marriage. Hence in more than half the cases the male partner can be eliminated as the etiologic factor.

In six cases the patients had been operated upon before the appendectomy and in 40 additional cases an operation was performed after the appendix was removed. In 20 of the 40 operations done after the appendectomy the tubes or ovaries or both were operated upon.

Huhner tests performed in 300 cases showed that the spermatozoa were normal in only 62 per cent. In 81 of the 465 cases the female genitalia showed signs of hypoplasia. There were 42 cases of retroflexion and retroversion, and enlarged, thickened or cystic adnexa in 86 additional cases.

The author found that appendicitis has a deleterious influence on the ovaries, for disturbed ovarian function as measured by disturbances in menstruation occurred in 32.3 per cent of the interval and in 16.67 per cent of the acute cases of appendicitis.

In most instances the disturbance was in the form of an oligomenorrhea or a hypomenorrhea.

In 306 cases the tubes were insufflated and found patent in only 39.5 per cent. Pregnancy occurred in 35 of the 306 cases or 11.4 per cent as compared with 16 per cent for the general group of 2113 patients who had Rubin tests. In almost half of these cases, conception took place within two months after the insufflation. The author concludes that even the mildest attack of appendicitis in a young woman or in a woman in the childbearing period should not be considered lightly but an appendectomy should be performed as early as possible. J. P. GREENHILL.

Moench, G. L., and Holt, Helen: Biometrical Studies of Head Lengths of Human Spermatozoa, J. Lab. & Clin. Med. **17:** 297, 1932.

Moench and Holt have made a special study of the biometrics of human sperm heads with reference to diminished fertility. Of 141 different cases studied, 124 were calibrated. They summarize their work on impaired human fertility as follows: Sterility and fertility are not separate entities, the latter being of various degrees and starting from a normal, proceeds gradually downward to such low values that clinical sterility results. Absolute sterility is much less frequent than commonly supposed, being due to gross lesions which in most instances can be determined. In the exact determination of the fertility of any given individual, all the factors in the history are almost as important as the physical examination.

By means of careful semen examinations it is possible to determine the degree of fertility of any given man. Such examination should include sperm count, motility, morphology and biometries of sperm head lengths. The number of sperms present and their motility must be judged very guardedly as purely temporary or accidental factors may give rise to misinterpretations. The morphology of the spermatozoa, and especially of their heads, seems to be the best and most reliable indication of their fertilizing power. The relative number of abnormal heads emitted apparently gives a direct index of reproductive fitness of the individual. Thus, no man in the series with more than 20 per cent abnormal heads had a good breeding record. Of the simple functions of the obtained curves, the coefficient of variation is the most important and was seldom much above 11.0 in a normally fertile man; the upper physiologic limits of this function seems to be about 11.5. In every case where abnormal curves and coefficients of variation above the normal limits or a mathematically significant skewness were present, the man's breeding record was poor. In most cases the morphology of the semen and biometrical results ran parallel. In some cases only the morphology was bad in others only the biometries; thus, neither a normal morphology nor a normal curve alone mean normal fertility, whereas an abnormal finding in either signifies a disturbance of spermatogenesis and, hence, of fertility. When the fertility sinks as low as 0.6 of the normal value, clinical sterility usually results. In this series spermatogenesis seemed to be most favorably influenced by sexual rest and improvement of the general physical condition of the patient. W. B. SERBIN.

Serdukoff, G.: Restorative Surgery of the Fallopian Tubes. Its Methods and Results, La Gynécologie, **31:** 193, 1932.

In the opinion of Serdukoff, tubal sterility in women is much more frequent that is commonly believed. The logical therapy of this form of sterility is surgical correction which may consist of salpingostomy, implantation, salpingolysis or a combination of these. However, every surgical intervention should be preceded by a Rubin test or hysterosalpingography for verification of the diagnosis and for localization of the obstruction. One must be certain that no infection or inflammation is present. At the time of operation, the permeability of the tubes should be checked up. The best

results are obtained after salpingostomy, for in the hands of some authors the incidence of success is 100 per cent. The incidence of favorable results after tubal implantation varies from 20 to 33 per cent and the technic of this operation is not difficult.

From fourteen to thirty days after operation the tubes should be insufflated or iodized oil should be injected into them by way of the uterus. When women conceive after these plastic operations it is best for them to be delivered in a hospital.

J. P. GREENHILL.

Tschertok, R. A., and Schor, M. I.: Tubal Patency After Intrauterine Injection of Iodine, Monatschr. f. Geburtsh. u. Gynäk. **92:** 186, 1932.

In four women, Tschertok and Schor determined that the fallopian tubes were patent by means of the injection of lipiodized oil. They then injected 1½ c.c. of 5 per cent tincture of iodine into the uterine cavity and the subsequent use of lipiodol proved that the uterotubal junctions were obstructed. This constituted confirmation of anatomic studies previously made by the authors. They had found that the injection of iodine into the uterus resulted in obstruction of the uterine end of the tube by a plug of fibrin. This favored implantation of the fertilized ovum in the fallopian tube, thus leading to ectopic pregnancy. Salpingography revealed that the obstruction is temporary. However, since the injection of iodine for the purposes of inducing abortion is by no means uniformly successful, and since it may result in ectopic pregnancy and permanent sterility, the authors warn against its use. J. P. GREENHILL.

Vignes, H., and Baron, F.: Experimental Study on the Regeneration of Resected Tubes, Bull. de la Soc. d'obst. et de gynéc. **4:** 225, 1931.

It has been demonstrated that a healthy fallopian tube after being cut possesses a remarkable power of regeneration and this is possible even after ligation, double ligation and resection, and crushing. Vignes observed such an occurrence in a rabbit and decided to study this type of regeneration and see whether the ovaries exerted any influence on it. Vignes and Baron operated upon 30 rabbits. In two rabbits examined seventy days after resection of the uterotubal junction and ligation of the ends, the tubes were distended by a large amount of serous fluid. Seven other rabbits had the same operation but in addition both ovaries were removed. At the end of seventy days their tubes were also found to have regenerated. They also contained a fluid but only a minimal amount, not sufficient to distend the tubes. In a rabbit with only one ovary removed the result was the same as in those not castrated.

In all cases the regeneration was not quite complete. The author draws attention to two facts. First the constant formation of an aseptic hydrosalpinx which distends the tubes and perhaps aids in their regeneration. Secondly the fact that the regeneration is not influenced by the presence or absence of the ovaries, but there is a difference in the amount of fluid secreted following the removal of the ovaries.

J. P. GREENHILL.

Fuchs, H., and Lork, E. C.: Roentgen Control of Tubal Sterilization, Monatschr. f. Geburtsh. u. Gynäk. **88:** 199, 1931.

In a series of 73 tubal sterilizations performed on private patients by one of the authors (Fuchs) in a period of twenty-six years he encountered only one failure. Fuchs and Lork believe that among all the tubal operations recommended for the purpose of sterilization two are especially noteworthy: The Madlener method of crushing the tubes, and the Menge-Stoeckel procedure in which the tubes are fixed in the inguinal canals extraperitoneally. During 1930 they performed 51 tubal sterilization operations and examined 35 of the women from three to nine months after opera-

tion by means of a salpingogram. In the series of 12 Madlener operations 5 were found to be failures anatomically and functionally, hence this procedure is not reliable. The strikingly large number of tubal pregnancies which follow the Madlener operation justify further restriction of this operation. The Menge operation appears to be satisfactory but requires more roentgenographic studies. The operation of radical removal of the tubes has proved to be free from failures according to salpingography but, clinically, failures have been reported following it. Hence the authors feel they must agree with Fraenkel's conclusions, that the only 100 per cent method of sterilization is removal of the fundus of the uterus together with both tubes.

J. P. GREENHILL.

Naujoks, H.: Reversible ("Temporary") Sterilization of the Female by Crushing the Fallopian Tube, Zentralbl. f. Gynäk. **55:** 81, 1931.

Madlener's method of sterilization by means of crushing the tube and ligating doubly with nonabsorbable suture material was modified by Walthard, who included a slightly larger loop of tube in the clamp. The present author gives a further modification as follows: The tube is crushed with a clamp at the ampullic end, for a distance of at least 1 cm., care being taken to include both muscle and mucous layers. One must be sure that, although the tube is crushed, it is not cut or torn. It is then doubly ligated at each end of the crushed area with nonabsorbable suture material. The method is advantageous because it is quick, simple, and bloodless, and because it is easily reversible at a later date by simply cutting the tube between the proximal ligature and the uterus, either with a knife or an endotherm cautery.

WILLIAM F. MENGERT.

Horneffer, L., and Meyerhoff, K.: The Question of Hormonal Sterilization, Zentralbl. f. Gynäk. **55:** 473, 1931.

It would be of great value to have an effective safe means of producing temporary sterilization. Reasoning that during pregnancy there must be some sort of substance which inhibits follicle development and ripening, the authors implanted ovaries taken from pregnant mice in the thigh muscles of four female mice. Two of these mice became pregnant after thirty-four and forty-three days, respectively, and the other two remained sterile for more than a year. The authors were also able to delay the appearance of heat in 21 mice by implanting an additional pair of ovaries, taken from nonpregnant mice, in the thigh muscles. However, they do not believe that these experiments present clear proof of hormonal sterilization and feel that further researches must be made to clarify the problem. WILLIAM F. MENGERT.

Mendelshtam and Tschaikovsky: Hormonal Sterilization of Animals, J. akush. i. zhensk. boliez. **42:** 757, 1931.

The authors used prolan of the Moscow Endocrinological Institute in which prolan B is predominating. Seventy-three female mice were injected with 10 mouse units of prolan in single dose. After four days they were put with male mice for mating and stayed together fifteen days, and then were separated. After twenty-four days (counting from the first day of mating) it was found that there were eleven pregnant mice. Of the sterile mice, three were killed. On histologic examination many corpora lutea (vera and atretica) were found.

Four days after injection of prolan in two control mice both ovaries were found luteinized. By this single injection of prolan the ovulation in mice was discontinued for five to six mouse cycles.

The authors think that prolan may some day be used for temporary sterilization of women. ALEXANDER GABRIELIANZ.

Tschaikowsky, V. K.: Sterilization of Animals Without the Use of Hormones, J. akush. i. zhensk. boliez. **42:** 758, 1931.

The author injected eleven female rabbits and eighty-nine mice three to four times with isogenic protein of placenta free from hormone. No rabbits became pregnant. After thirty-five days (from the first day of mating) only two mice were pregnant.

Injection of this same protein into pregnant rabbits led to abortion.

Histologic examination of ovaries revealed death of the ovum in all stages of ripening of the follicles. In the liver and kidneys no signs of toxicity were found. Some changes were found in the thyroid gland. Five rabbits were further observed in which sterility lasted from two to five months. The offspring of these animals were born at term and were healthy. ALEXANDER GABRIELIANZ.

Unbehaun: The Effect of Nicotine on the Ovaries of White Mice, Arch. f. Gynäk. **147:** 371, 1931.

The author found that subjecting white mice to nicotine poisoning resulted in the production of definite pathologic changes in the ovaries. Estrus was always definitely delayed. Histologically the ovaries, following nicotine poisoning, showed degenerative changes in the ripening follicles together with a definite decrease in the number of atretic follicles. The connective tissue of the interstitial portions of the ovaries was always definitely increased. Cyst formation was never found. RALPH A. REIS.

AMERICAN BOARD OF OBSTETRICS AND GYNECOLOGY

The next written examination and review of case histories will be held in cities throughout this country and Canada where there are Diplomates who may be empowered to conduct the examination, on April 1, 1933.

The next general, clinical examination is to be held in Milwaukee on Tuesday, June 13, 1933, immediately preceding the annual session of the American Medical Association. Reduced railroad rates will apply.

The Diplomates of the American Board of Obstetrics and Gynecology in attendance at the coming scientific meeting of the American Medical Association in Milwaukee, June 14 to 16, will hold a dinner and Round Table Conference on the evening of the first day of the scientific session, June 14, at the Hotel Schroeder. At this dinner, the successful candidates certified at the preceding day's examination will be introduced in person. A short address will be made by one or more of the Board officers, and a general discussion of Board activities will follow. Diplomates of the Board are urged to attend and to bring any interested guests. The subscription for the dinner will be nominal and reservations may be made in advance through the Secretary's office.

Early application is requested from those desiring to qualify for these examinations. For further information and application blanks address the Secretary, 1015 Highland Building, Pittsburgh, Pennsylvania.

William Phillips Graves
1870-1933